VOL. LXXIX. No. 2033. [All Rights Reserved.] NOVEMBER 10, 1916. [Registered at G.P.O. as a Newspaper and Canadian Magazine rate of postage.] PRICE FOURPENCE.

LONDON: PUBLISHING OFFICE, 4, LUDGATE HILL, E.C. SUBSCRIPTION per annum, Postage inclusive, in Great Britain, £1 1s. 8d.; Canada, £1 2s. 10d. ($5.80); to all other countries, 30s.—NEW YORK: D. VAN NOSTRAND CO., 25, Park Place, New York City. TORONTO, ONT.: WM. DAWSON & SONS, LTD., Manning Chambers. PARIS: BOUVEAU & CHEVILLET, Libraires Etrangers, 23, Rue de la Banque. Telegraphic Address: "Agsetzy, London." A B C Code. Telephone Nos. City 997; Central 4425 (Editorial only).

**MOULDED INSULATORS**
Of all Descriptions.
**LITHOLITE, Ltd.,**
55-57, Hackney Grove, London, N.E.

AIR COMPRESSORS & VAC. PUMPS, Desiccators Sets. NORMAN DICKSON, PRINGLE & CO. Cable Pumps & Impregnators.
25, Victoria St., Westminster.

**TINNING FURNACE**
(Hall's Patents).
UNIFORM CONTROL OF TEMPERATURE
For Coating Wire and Dipping.
*Easy payments arranged in special cases.*
Monometer Manufacturing Co., Ltd.,
ASTON, BIRMINGHAM.

WIRES.
**THE GENERAL CABLE MANUFACTURING CO., LTD.,**
Imperial House, Kingsway, London, W.C.
Phone: Regent 5781.
CABLES.

**BROOK MOTORS.**
See Advertisement, Sup. 42.

**SWITCHGEAR.**
**ERNEST F. MOY, LTD.,**
Manufacturing Electrical Engineers and Government Contractors.
GREENLAND PLACE, CAMDEN TOWN, LONDON.

TAYLOR & CO.
**MICA & MICANITE**
INSULATION.
TELEPHONE:—CENTRAL 4575.
40, HATTON GARDEN, LONDON, E.C.

EVERY DESCRIPTION OF
**SMALL TURNED PARTS and CASTINGS for ELECTRICAL ENGINEERS.**
A. MORTON,
6, Tenby Street North, Birmingham.

**CHURTON**
SINGLE and POLYPHASE
**MOTORS.**
T. HARDING CHURTON & CO., LTD.,
Atlas Works, Water Lane, LEEDS.

**LIFTS and - - - TRANSPORTERS.**
Wm. WADSWORTH & SONS, LTD.,
BOLTON.

**"EMPIRE" AUTOMATIC CONTROL**
FOR
Shell Presses, Compressors, Machine Tools.
ELECTRIC CONTROL, LIMITED, GLASGOW

**WESTERN-ELECTRIC COMPANY, LIMITED,**
Norfolk House, Victoria Embankment, W.C.
Works: NORTH WOOLWICH, LONDON, E.
TELEPHONES & CABLES.
See Advertisement last week, Sup. 24.

**CONNOLLY BROS., Ltd.,**
for
WIRES AND CABLES.
See Advertisement this week, p. iii.

**WHITE**
Electrical Instrument Co.
*2, 4, & 6, GLOUCESTER ST., CLERKENWELL, LONDON, E.C.*
Wire: Voltograph, London. 'Phone: City, 8060.

**MAVOR & COULSON, Ltd.,**
GLASGOW.
**MOTORS, DYNAMOS, SWITCHGEAR.**

**INSULATING - - BEADS - -**
*Immediate Delivery.*
HOLDER-HARRIDEN LTD., 35|37, Noble St., London, E.C.

**CABLES AND WIRES. SWITCHBOARDS. ARC LAMPS.**
**JOHNSON & PHILLIPS, LTD.,**
CHARLTON, LONDON, S.E.

*Better than Rubber, Leather and Gutta-Percha*
**WASHERS**
**DERMATINE**
DERMATINE CO., Ltd.,
Neate St., London, S.E.

LARGE STOCK KEPT FOR QUICK DELIVERY
**SHUNT REGULATORS,**
MOTOR STARTERS and all classes of Resistance Work.
The SOLENOID REGULATOR Co., *Highgate Sq., Camp Hill.*
Telephone: Midland 582. BIRMINGHAM Telegrams: "Solenoid, Birmingham."

BLANKS. PIERCING.
**STAMPINGS**
METAL.
HAROLD, HARLEY & Co.,
Harley Works, Beckton Road, London, E. 'Phone: East 1800.

**STONE'S ELECTRICAL INSTALLATIONS for RAILWAY CARRIAGES.**
*50,000 COACHES EQUIPPED ALL OVER THE WORLD.*
J STONE & COMPANY, Ltd.,
Deptford, London.

**THERMIT, LIMITED,**
675, COMMERCIAL ROAD,
LONDON, E.
'Phone: EAST 4157. 'Grams: "Fulman, Step, London."
PATENT
Alumino Thermic Welding Process.

**VICTORIA DYNAMO & MOTOR CO.,**
CRAVEN HOUSE, KINGSWAY, LONDON.
*Send for Stock List of Motors ready for delivery.*

**INGLEBY & CO., LTD.**
ELLAND ROAD, LEEDS.
MOTORS FOR DIRECT AND ALTERNATING CURRENT
Tel. 378
Delivery from Stock up to 50 H.P.

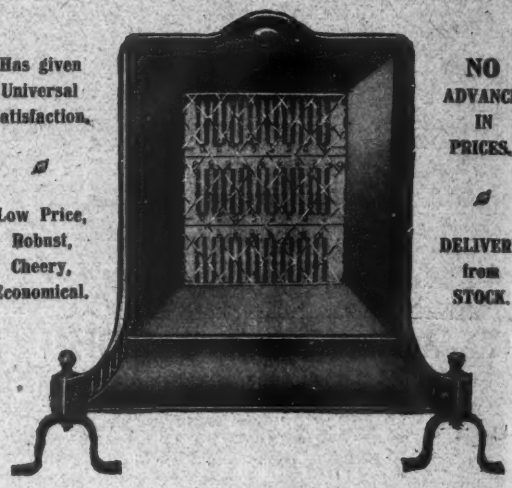
*Advertisement Index, see page xxiv.*

# EDISWAN EVERYTHING ELECTRICAL

THE EDISON SWAN ELECTRIC CO., LTD.,
PONDER'S END
MIDDLESEX.
'PHONE: 520 ENFIELD.

FULLY LICENSED UNDER BRITISH PATENTS Nos 2813/06-2777/05 AND OTHERS.

THE
# ARORA
ELECTRIC
FIRE.



Has given Universal Satisfaction.

Low Price, Robust, Cheery, Economical.

NO ADVANCE IN PRICES.

DELIVERY from STOCK.

*Write for List E (Fires and Cookers) to Sole Manufacturers:*

**THE ARORA CO., Loughborough.**

VULCANISED INDIA-RUBBER

# CABLE

DELIVERIES FROM STOCK.

ALSO SWITCHGEAR, STARTERS, INSTRUMENTS, ETC.

**WM. GEIPEL & Coy.,** HEAD OFFICE: ST. THOMAS STREET, LONDON, S.E.
CABLE WORKS: WEMBLEY, LONDON.

PATENT. LOUD SPEAKING. WATER-TIGHT.

# TELEPHONES

ALFD GRAHAM & Co.,
CROFTON PARK, S.E.

FOR SHIPS, MINES, POWER STATIONS, ETC.

ADOPTED BY THE BRITISH ADMIRALTY, MANY FOREIGN GOVERNMENTS & THE LEADING STEAMSHIP LINES.

# BASTIAN METERS

FOR DIRECT CURRENT ONLY.

Made in ENGLAND with BRITISH CAPITAL & BRITISH LABOUR.

*Buy the cheapest and most efficient meter on the market from:*

**THE BASTIAN METER CO., Ltd.,**
Bartholomew Works, Kentish Town, N.W.

# VULCANISED FIBRE.

In Sheets, Rods, Tubes, and Special Shapes.
Horn Fibre, Diamond Insulation Press Board, Fuller Board, &c.

DIAMOND FIBRE TRADE MARK

**DIAMOND STATE FIBRE CO.,** 57, OLD ST., LONDON, E.C.

THE

# ELECTRICAL REVIEW.

VOL. LXXIX. NOVEMBER 10, 1916. No. 2,033.

## ELECTRICAL REVIEW.

Vol. LXXIX.] CONTENTS: November 10, 1916. [No. 2,033.


| | Page |
|---|---|
| Linking-up and Wayleaves | 505 |
| Dublin's Electricity Supply | 506 |
| Dick, Kerr Purchase A.E.G. Interests | 507 |
| N.E.C.A. Activities | 507 |
| The Successful Manager | 508 |
| A Large D.C. Station (*illus.*) | 508 |
| New Electrical Devices, Fittings and Plant (*illus.*) | 510 |
| Correspondence— | |
| "Summation Watt" Capacity of Field Rheostats and the Like | 511 |
| The Prevention of Bribery | 511 |
| Between two Stools | 512 |
| Legal | 512 |
| Dublin Electricity Supply | 512 |
| War Items | 515 |
| Business Notes | 516 |
| Notes | 521 |
| City Notes | 524 |
| Stocks and Shares | 525 |
| Electric Tramway and Railway Traffic Returns | 526 |
| Market Quotations | 526 |
| Metal Market—Fluctuations in October | 527 |
| Wayleaves, by "An Interested Onlooker" | 527 |
| Electric Cooking and Heating, by A. F. Berry | 530 |
| Electric Vans for Laundry Work | 531 |
| The National Insurance Act, 1911 | 531 |
| Electrochemistry in Norway | 531 |
| New Patents Applied for, 1916 | 532 |
| Abstracts of Published Specifications | 532 |
| Contractors' Column | Advertisement page xx |



## THE ELECTRICAL REVIEW.

**Published every FRIDAY, Price 4d.**

*The Oldest Weekly Electrical Paper. Established 1872.*

TO BE OBTAINED BY ORDER FROM ANY NEWSAGENT IN TOWN OR COUNTRY.

**OFFICE:—4, LUDGATE HILL, LONDON, E.C.**

Telegraphic Address: "AGREKAY, LONDON." Code, A B C.

Telephone Nos.: City 997; Central 4425 (Editorial only).

The "Electrical Review" is the recognised medium of the Electrical Trades, and has by far the Largest Circulation of any Electrical Industrial Paper in Great Britain.

**Subscription Rates.**—Per annum, postage inclusive, in Great Britain, £1 1s. 4d.; Canada, £1 8s. 10d. ($5.80). To all other countries, £1 10s.

**FOREIGN AGENTS:**

ADELAIDE: Messrs. Atkinson & Co., Gresham Street.

AUCKLAND N.Z: Gordon & Gotch, Albert Street; The Mining and Engineering Review, 31a, Strand Arcade, Queen Street.

BRISBANE: Gordon & Gotch, Queen St.

CHRISTCHURCH, N.Z.: Gordon and Gotch, Manchester Street.

DUNEDIN, N Z.: Gordon & Gotch, Princes Street.

JOHANNESBURG, CAPETOWN, BLOEMFONTEIN, DURBAN, PORT ELIZABETH, &c.: Central News Agency, Ltd.

LAUNCESTON: Gordon & Gotch, Cimitiere Street.

MELBOURNE: The Mining & Engineering Review, 90, William Street; Gordon & Gotch, Queen Street.

MILAN: Fratelli Treves.

NEW YORK: D. Van Nostrand, 25, Park Place.

PARIS: Boyveau & Chevillet, 22, Rue de la Banque.

PERTH, W.A.: Gordon & Gotch, William Street.

ROME: Loescher & Co., Corso Umberto 1° 307.

SYDNEY: The Mining & Engineering Review, 273, George Street; Gordon and Gotch, Pitt Street.

TORONTO, ONT.: Wm. Dawson & Sons, Ltd., Manning Chambers; Gordon and Gotch, 132, Bay Street.

WELLINGTON, N.Z. Gordon & Gotch, Cuba Street.

Cheques and Postal Orders (on Chief Office, London) to be made payable to THE ELECTRICAL REVIEW, and crossed "London City and Midland Bank, Newgate Street Branch."



**THE UNIVERSAL ELECTRICAL DIRECTORY**

**(J. A. Berly's).**

# 1916 EDITION.

**H. ALABASTER, GATEHOUSE & CO.,**

**4, Ludgate Hill, London, E.C.**


## LINKING-UP AND WAYLEAVES.

FROM time to time we have drawn attention to the great importance of the wayleave problem to the development of electricity supply in this country—a problem which, at all times thorny and difficult, has lately become of the greatest urgency in view of the national movement towards the linking-up of isolated electricity supply undertakings. It is one of the undesirable results of our highly complex civilisation that the rights of ownership of land in this old country, which formerly were properly regarded as held in trust for the community to which they really belong, in course of time have become entirely vested in the individual, who can dispose of them as he thinks fit; and unfortunately, only too often he is inclined to fix an outrageously exorbitant price upon the very moderate concession of the right to carry electric cables across his property, through the air or in the subsoil, although the loss of user or the inconvenience to which he is subjected by their presence is infinitesimal. And this is true, whether the owner be a private person, a public company, or even—save the mark!—a local authority. Moreover, the victims of this grasping policy are not only "limited companies," which are so commonly regarded as fair game for plunder, but include also individuals and public bodies. The extortion thus attempted is usually a manifestation of greed combined with utter indifference to the public welfare. One can understand the position of an owner who, for æsthetic reasons, flatly forbids the suspension of wires over a picturesque tract of country which he claims as his property; but the attitude of the ordinary extortioner is merely contemptible, and frequently involves the unfortunate supply undertaking in heavy and unjustifiable expense to circumvent the obstacle.

From these conditions there appears to be but one avenue of escape—the power of Parliament, as the representative of the State, in which all ownership is ultimately vested, to override the eccentricities of the private owner, either by granting compulsory wayleaves or by compelling the owner to submit to arbitration and to accept a fair return for the small concession involved. Only by a quick and easy procedure at small cost can the due development of electricity supply in sparsely populated districts, and the linking-up of neighbouring supply systems, be brought about, and now is the time for the electrical industry to bestir itself with this end in view. The opportunity is particularly favourable in view of the declared intention of the Board of Trade to back up the supply undertakers in the direction of co-operation, the general weakening of individual rights and privileges under war conditions, and the national demand for economy and industrial reform. In view of the great importance of the subject we commend to the notice of our readers the article on "Wayleaves" printed elsewhere in this issue, the writer of which is not only "an interested onlooker," but is also intimately acquainted with the situation and its needs. As he points out, "it is essential to the electricity supply authorities that simplicity of procedure, combined with speed and a definite time-limit, should be secured." Our contributor outlines a course of procedure calculated to attain these ends, and the time is ripe for action on the part of the Institution, which has already recommended the formation of a Government tribunal to control the supply of elec-

tricity, to which the necessary powers might be given. This would be preferable to placing the matter in the hands of the Board of Trade, which is already overburdened with powers and duties of the most diverse and, possibly, incongruous descriptions. Surely it is high time that the various branches of Government departments which at present deal with electrical matters were brought together as a single organisation under one head; the distribution of Messrs. Trotter, Ram, Nelson, and other officials amongst the different departments is adverse to the attainment of the highest efficiency, and though these gentlemen, thanks to their personal qualities, have hitherto succeeded in co-operating harmoniously and effectively, we cannot doubt that their more intimate association would tend to the welfare of the electrical industries.

## DUBLIN'S ELECTRICITY SUPPLY.

The fact that all was not well with the electricity supply undertaking of the City of Dublin was not unknown to anyone acquainted with the history of its constitution, equipment, and administration; our own columns have borne testimony to the troubles with which it has been beset, when from time to time the curtain has been partially raised and a glimpse of the inner working of the department has been obtained. But who, outside the staff itself, could have surmised that its affairs were in so unhappy a condition as it revealed by the remarkable report of Mr. P. W. d'Alton, of which we give the gist elsewhere in this issue?

That serious defects in the administration of the undertaking were suspected or known to exist was clearly shown by the action of the City Council, in appointing a Special Committee in April, 1915, to inquire into the conduct of its affairs; and the Committee was fortunate in its choice of an expert to carry out the exhaustive inquiries that were necessary, and to advise it as to the best course to pursue in order to remedy such diseases as he might diagnose. Few men in this country can have had a more varied or comprehensive experience in the erection and management of steam and electrical plant than Mr. P. W. d'Alton, who, moreover, possesses the quality, invaluable in dealing with Irishmen, of being of that nationality himself and able to understand the temperamental peculiarities of his fellow-countrymen. His verdict may be accepted without hesitation.

The report possesses two distinct aspects, largely independent of one another: it deals on the one hand with the actions of the City Council and its committees, and on the other with the work of the technical staff. That the former were influenced only to a moderate extent by the advice of the staff, and were sometimes decided upon in direct opposition to the views of the engineers, is shown by the report, and is also known from the history of the undertaking. We may especially draw attention to the following incidents: the determination of the Council to adopt the Pigeon-House Fort site for the power station in 1899, in spite of advice to the contrary and of its obvious disadvantages, together with the refusal of the Council to rectify its error in 1911, when an admirable opportunity offered to build a new station in a more favourable position; and the persistent placing of the contract for coal in the hands of one firm, at a price which, Mr. d'Alton says, is very high. It is difficult to conceive of circumstances which could justify such actions, but it is only too easy to imagine cogent reasons for them.

As for the technical staff of the department, which appears to be somewhat over-manned—for which the Council and not the engineers are responsible—it is difficult to account for its methods of operation, except on the basis that economy was a secondary consideration. Apparently the regular practice has been to run the most extravagant plant in the station as much as possible, and to use the modern economical boilers and turbines only on the peaks! How anyone can hope to justify so extraordinary a system of procedure we cannot imagine. No better method could be devised if the object were to consume as much coal as possible.

It will be observed that Mr. d'Alton adversely criticises the system of dual control which obtains at Dublin; in this we cordially agree with him. We have repeatedly urged in these columns that if the best results are to be obtained from a commercial enterprise such as public electricity supply, it is essential, first, to select an able man as engineer and manager, and secondly, to give him a free hand, with full authority over his subordinates. We believe we are correct in saying that Mr. Mark Ruddle, the city electrical engineer, has never been given a free hand; his recommendations have been deliberately ignored by the Council, and he has not even been permitted to select his own staff, still less to dismiss those whom he found unsatisfactory. A committee should never attempt to run a department; its function is to see that the department is properly conducted by the manager whom it appoints for the purpose, and it should never on any consideration act behind his back or undermine his authority. In this instance we believe the Electricity Supply Committee is not to blame so much as the Council, which has repeatedly flouted the Committee's advice when the latter supported the engineer. In passing, we may point out that though Mr. Ruddle has for many years carried out all new construction, thus saving the cost of a consulting engineer's advice, he has never been awarded a farthing by way of remuneration for his special services.

Since writing the foregoing comments, we are glad to see that the Committee, by a majority of eight to one, has recommended the Council to invite Mr. d'Alton to take entire charge of the undertaking for a period of three years—the only course that offers a reasonable prospect of restoring prosperity to the undertaking. Of course there is another side to the question—will so busy a man as Mr. d'Alton, with his manifold professional engagements, including important functions in the service of the State, find it compatible with his own interests and those of his other clients to devote the whole of his time and energy to the service of Dublin City? It seems, to say the least, unlikely; but possibly some middle course may be found, which will enable him to supervise the reorganisation of the undertaking and to place it on a new basis without serious interference with his activities in other directions. Another question that arises is whether he, or any other eminent engineer, would care to take the risks involved in the attempt to pull the undertaking out of the difficulties in which it is entangled, at a time when the local and national circumstances are so unfavourable to a successful result. However, that is a matter for Mr. d'Alton to decide, and we hope that he will find it possible to come to the rescue of this ill-starred undertaking.

**Dick, Kerr Purchase A.E.G. Interests.**

To eliminate German ownership from businesses in England during the war is of the utmost importance, but in the interests of British trade after the war it is most essential that such ownership should be transferred to British concerns which are not only entirely above any suspicion of having enemy connections, but are best fitted by experience and in other ways to derive the fullest possible industrial advantage from whatever they take over. We feel, therefore, that the British electrical industry should find occa-

sion for self-congratulation in the announcement which is reprinted in our "War Items" to-day concerning the taking over of the British staff, stock, trading connections and records, also the "goodwill" of the A.E.G. Electric Co., Ltd., from the Controller appointed by the Board of Trade, by Messrs. Dick, Kerr & Co., Ltd. The activities of this particular A.E.G. branch were very extensive in the carrying out of what is best understood as industrial installation work, such as colliery, shipbuilding, and works equipments, a department of the industry in which it was possible for Continental manufactures to be introduced without receiving the same publicity as municipal contracts involved.

Messrs. Dick, Kerr & Co. have had a wide experience of work of this kind, and are pre-eminently suited to complete the contracts which were in the hands of the A.E.G. interests. The British staff of the latter will no doubt gladly welcome the change-over to purely-British employment, and, if we mistake not, their past experience and the business records of one kind and another that pass over with the "goodwill" will be of considerable value in the new owners' future trading and contracting operations. No questions relating to patents arise in connection with the transaction, as this particular A.E.G. concern was purely a contracting company. It is a moot point what is the value of the goodwill of a German company ordered to be wound up under the Trading with the Enemy Amendment Act. Such value varies according to the character of a business, and the mind of its valuer, in normal times; the profits, past and reasonably prospective, are really the only true criterion. That being so, what are the prospective profits of any A.E.G. company in the British Empire? If sentiment be a controlling factor, profits and goodwill will be very negligible quantities for some time. But the matter of winding up companies under the Trading with the Enemy Acts seems to be a very complex one, and if it be correct that winding up in such cases does not necessarily mean liquidation, then the Acts hardly seem to carry the matter as far as national sentiment desires. Nothing would please the enemy better than to feel that in spite of all our attempts to extirpate his influence from our industries, the way was, for want of firmness on our part, left open for an early resumption of his activities. The action of Messrs. Dick, Kerr and Co. in making this purchase is an indication that some of our firms recognise that the present situation demands appropriate individual initiative from within in organising the industry, and that too much dependence must not be placed on measures which the Government may introduce.

---

**N.E.C.A. Activities.**

Organisation is not generally considered to be a predominant characteristic of the British race. Rather have we allowed the Prussians to claim unchallenged the palm for that accomplishment. This being so, it was with pleased surprise that one read in Mr. Gribble's articles describing his experiences in Ruhleben Camp of the amazement of the Germans at the genius for organisation which the interned prisoners had shown. From a state of chaos, they so quickly organised themselves into a self-contained, self-governed community that the Germans were forced to express their astonishment and admiration, and to remark that, under similar conditions, they themselves would have been as helpless as babies.

The explanation of this seeming paradox would appear to be that, owing to a long period of military dominance, the Germans are now very amenable to discipline, or *compulsory co-operation*, whilst the British, with their love of freedom from restraint, resent any form of interference with their liberty of action, but will *voluntarily co-operate* for common objects when the necessity or advantages of such co-operation are appreciated. It is largely because of this difference in national characteristics, and on account of the necessity of a prolonged period of education before the benefits of co-operating for the attainment of improved conditions are appreciated, that associations of contractors, manufacturers, &c., take so long in this country to become firmly established, and to attract sufficient members to justify an association in claiming for itself that it is representative of any particular section of industry.

The National Electrical Contractors' Association, for example, has now been in existence for over 15 years, yet it could not be claimed either from the point of view of numbers or the amount of capital represented, that it is anything like representative of the whole electrical contracting industry of this country. There is still a very great amount of missionary work to be done before the great majority of electrical contractors become educated up to the idea that unity is strength, and that results may be achieved by co-operative effort which are impossible to the individual.

Among the objects of industrial associations are the raising of the status of their members, the improvement of the standard of work, the elimination of questionable practices, the obtaining of better prices, and so on. By far the most attractive of the objects are those which aim at improved financial conditions, and success in this direction generally outweighs, in the opinion of the majority, all other advantages. Thus we gather from a recent issue of *The Electrical Contractor* that the value of the E.C.A. cable rebate is appreciated far more highly than "the other less tangible, but (in the Editor's opinion) far more valuable assets derived from membership."

It was possibly with this knowledge, and with the object of enlarging its powers in the direction of developing the financial side of the Association, that it has now blossomed out into the N.E.C.T.A., Ltd. The formation of the limited company was necessary in order to put into force the *Guaranteed Work* scheme of the Association, as, according to its Charter of Incorporation, the Association was prohibited from doing any act which would give to its own members advantages not possessed by contractors outside its membership.

By the *Guarantee of Work* scheme customers will be indemnified against faulty or defective installations, and the Association will have power to compel members to "make good," should an installation be proved to be defective. The scheme is not exactly an insurance scheme, as no premium is payable; it is, in effect, an agreement between the Association and the individual members that work proved to be defective shall be put right by the original contractor free of expense to the customer or, failing compliance, at the expense of the Association.

Now that the limited company has been formed, no doubt many other directions will open for its activities, such as the negotiation of trading treaties with other associations, by which members only will benefit; trading arrangements with supply authorities; the handling in bulk of employers' liability and other insurance matters; collective buying and distribution of goods; the organisation of exhibitions and co-operative showrooms, and so on.

We should like to see among the leading items in its programme the formulation of a definite and satisfactory form of apprenticeship, coupled with a final test examination, which shall confer as definite a status on electrical wiremen as is now possessed by the "registered plumber." Now that the Association is in touch with the City and Guilds of London Institute this is a matter which should not be difficult to bring to a satisfactory issue. We shall follow with increasing interest the development of the Association's useful work.

## THE SUCCESSFUL MANAGER.

[COMMUNICATED.]

It is the American advertiser who has started appealing to that desire possessed by multitudes of rising to the top of the tree. The advertisement generally runs down the idea of working at a bench or behind a counter, and represents the man who goes in for the course of training advocated as sitting at a desk on which stands a portable telephone, laying down the law to some servile looking workman. We have heard a lot lately about "the will to power," and the Germans have shown us plenty of illustrations of that determination to be efficient which merits success.

A love of work and a determined character will fit a man to be made a foreman.

To these add a good education and technical ability, and one is fitted to be in charge of a department.

To the above add commercial ability and as many of the qualities enumerated below as possible, and any position is attainable.

The following catalogue of talents, natural and acquired, is chosen as suitable for a man occupying a very responsible position, and in charge of large number of men.

A superior quality of character and intellect are necessary. This will give a natural leadership over the average man. A sense of superiority will give a manager confidence. He will feel his dignity, and be proud of his position, and there is no harm if he is slightly puffed up with a sense of his own importance, provided he does not carry it too far, and suffer from swelled head. This would make him ridiculous, and no one in authority can afford to have those under him sniggering at him behind his back. His character and abilities must be such as to command their respect.

To be too intellectual is not desirable. Such a man is apt to look too far ahead for the best method, quite forgetting that it is the common-sense, practical method, adopted quickly, that is wanted. A very intellectual man is apt to become a recluse, a student of books rather than of human nature, and while such tastes may benefit a professional man, what we are considering is the best type of man to manage other men. It is better for a manager to leave the study of technical details to an assistant, whose duty must be to keep him informed of new improvements, and where to get the best information quickly. A strong will is absolutely necessary, and also the ability to put up a good fight if required. A peace-at-any-price man will always be imposed on. A reputation for being able to hit hard, and keep it up, will prevent other firms or employés from interfering in a manager's projects without good cause. A continual fighting attitude is, of course, bad. It will repel any thought of offering help from other managers, and drive away good assistants. The employé must feel that the manager's interests and his own are similar, if not identical, to ensure satisfactory and harmonious working. Firmness without despotism and the insistence of orders being carried out is what is wanted. The willingness to accept responsibility must go with a strong will. Unless he has this pluck a manager will be afraid to take any risks for fear of a venture turning out badly. Big successes are mostly obtained through taking risks. There is the strong temptation to throw the blame on a subordinate for an unsuccessful venture, To blame when the failure is due to the subordinate disobeying orders or showing lack of skill is just, but if this is not the case it is bad policy. If done repeatedly the best of the assistants will either leave to obtain fairer treatment or refuse to take an interest in their work.

A magnetic personality is a gift which is invaluable in dealing with directors, committees, or employés. If one is deficient in this respect a persuasive eloquence must be attained to take its place. The art of speaking well and in such a manner as to convince your hearer that your desires or plans of action are the correct thing and what should be carried out, is worth a good deal in business. The person may realise afterwards that you are wrong, but meanwhile he has agreed to what you want.

A mean, petty spirit is to be avoided. The minute attention to details will probably result in the firm saving pence and losing pounds. It is right and proper that the rank and file should exercise economy in the use of material, but the seeing that they do so should be left to an assistant, and only occasionally receive the attention of the manager. The fidgeting over trifles irritates the staff and prevents the manager attending to the big things in business life. He should not suffer from a chronic bad temper, or be perpetually on the go. The former will breed indifference amongst the employés, whilst the latter gives him no time for the quiet planning which is necessary. Both are signs of nervous tension which should be improved either by a holiday or by a changed method of living. A manager must have a "thick skin." A sensitive man who is hurt by pin-pricks is no good for a high position. The higher the position the more one is subject to attacks, and to be badly affected by them impairs one's efficiency.

A good memory is a valuable asset, and anyone may make considerable improvements with or without the use of any special system. Thought control is a great help to efficiency. It gives one the power to exclude all other matters except the one requiring immediate attention, and when away from business to forget all about it, thus giving the mind a necessary rest.

Nothing absolutely ideal is to be expected in this world, and no man possesses all the qualites that have been enumerated. This, however, does not prevent any manager, or would-be manager, from glancing through the list, noticing something that he is well aware that he is rather lacking in, and determining to acquire, as far as possible, this aid to efficiency.

## A LARGE D.C. STATION.

The generating station at the Detroit Works of the Ford Motor Co. is said to be the largest purely direct-current station in the world, having a maximum rating of 65,000 KW. at 250 volts, and embodies many novel features in design. When complete, it will contain 14 reciprocating engines of 6,000 H.P. and one of 4,000 H.P., driven by gas and steam, and one 1,500-H.P. steam engine. These engines are coupled to Crocker-Wheeler generators of 4,000, 2,500, and 1,000 KW. respectively, running in parallel on a two-wire system at 250 volts, 80 R.P.M. Turbines were not used on account of the inadequate water supply; and the cost of the extra apparatus required for A.C. transmission was considered to balance the cost of the additional copper for the D.C. system. The installation was recently described by the electrical engineer to the company, Mr. Fred Allison, in a paper read before the American Institution of Electrical Engineers, and abstracted in the *Electrical World*, from which we take the following particulars:—

The operation of the composite gas-steam sets raises some novel points. In the interest of economy, it is desirable that the proportion of the load on the steam side be held to a minimum, consistent with proper governing in response to load variations, as the thermal efficiency of the gas side is greater than that of the steam side. Since it is almost impossible to make gas of a constant quality, the performance of the gas side of a given engine will vary somewhat according to the quality of the gas, the conditions of the igniters, &c. Therefore, if this side of the engine shows unfavourable symptoms, the load of that unit is automatically taken over by the steam side. In operating such large units, it is of great importance that the watch engineer shall have full control of the load on his engine. It will be seen, therefore, that the division of the load between units operating in parallel must within certain limits be handled between the engines and the switchboard, so that the control of the load is handled at the engine. Safety considerations as to the governing make it desirable that the sudden loss of the working load consequent upon the opening of the circuit-breaker shall instantly stop the production of power on the gas side. This end is attained by interrupting the ignition circuit coincidentally with the opening of the circuit-breaker by means of a switch provided for that purpose, and functioning with the circuit-breaker. Another device controlled by this switch is the gas-throttle control magnet, the de-energisation of which results in shutting off the gas supply.

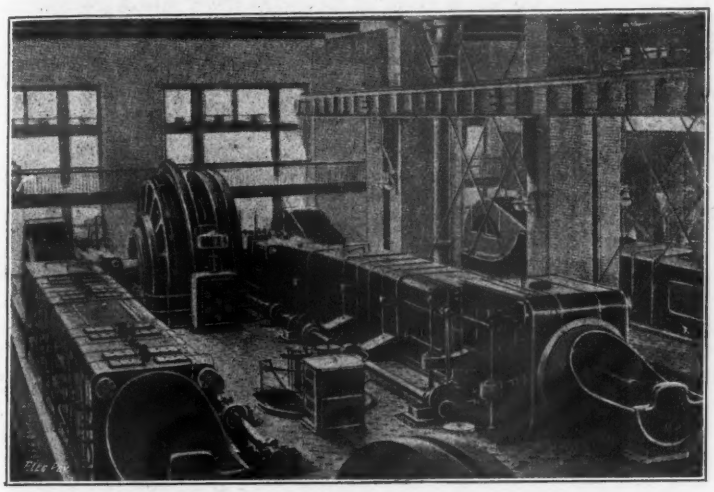
The generators are of the commutating-pole type, with compound-wound magnets; the armatures of the 4,000-KW. machines are 15·5 ft. in diameter and carry 1½ tons of copper windings each, while the commutator is 9·5 ft. in diameter and contains over two tons of copper.

The brush bus-rings, with the interpoles and field windings, add another 1½ tons of copper, making in all over 5 tons to each machine. The armature shaft is 34 in. in diameter, and the journals are 50 and 60 in. long.

The gas engines are of the two-cylinder 4-cycle type, with cylinders 42 in. in diameter and a stroke of 72 in. The piston rods are chrome-vanadium-steel forgings 13 in. in diameter and 16·5 ft. long. One gas engine weighs 250 tons, and has an output of

3,300 H.P. at full load ; it is believed that this is the highest output per ton achieved up to the present. Water cooling is applied to the cylinders, housings, piston rods, valve boxes, and main bearings, and the water, leaving the engine at about 175° F., is used for boiler feed and for the hot water supply to the factory. The exhaust gases have a temperature of 1,100° F., and pass through a superheater situated in the steam line between the high and low-pressure steam cylinders. Afterwards the exhaust gases pass round the steam cylinder jacket, and finally through an economiser before discharge to the stack.

Ignition is provided by a double set of plugs to each cylinder, of the make and break type. The ignition leads pass through a switch, which is automatically operated when the equaliser switch



One of the 6,000-H.P. Gas-Steam Sets at the Ford Works.

is closed, and, as indicated above, provision is made to open the ignition circuit if the main circuit-breakers open, thus cutting off the power on the gas side, while the governor takes care of the steam side. The make and break is effected by electromagnetic devices, to which the current is distributed in proper sequence by a simple commutating device, the mechanism being so timed that when the brush leaves a segment the corresponding igniter is at its maximum opening. Excellent results are obtained by this method of ignition.

The steam engines are of double-expansion Corliss-valve design, with cylinders in tandem on the piston rod. The diameter of the high-pressure cylinder is 36 in., and that of the low is 68 in. The stroke is 72 in. Steam at 700° F. enters the high-pressure cylinder at 180 lb. per sq. in.

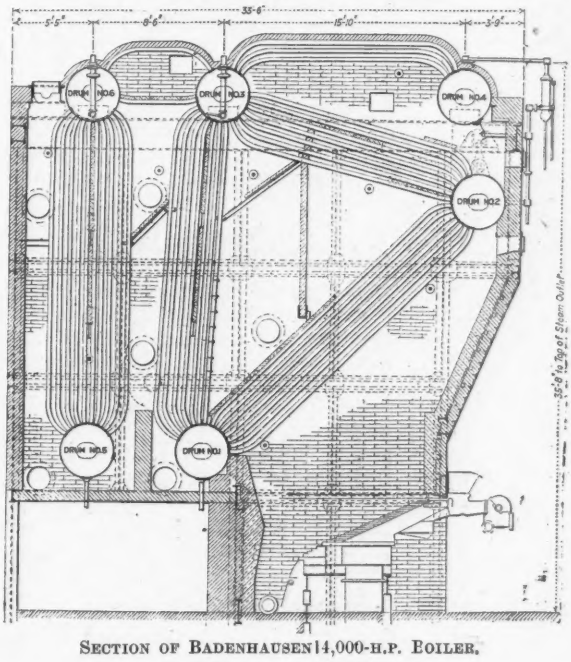
The condensing water is cooled with sprays over cooling ponds.

Coal bunkers, stokers, and boilers are located on the third floor ; the boilers are rated at 4,000 H.P. each, and are to be 14 in number, consuming 2,000 tons of coal per day of 24 hours, and evaporating 22,000 tons of water. The second floor is occupied by the main steam piping, the vacuum ash-handling mechanism, oil filters handling 3,000 gallons per hour, and the exhaust gas economisers.

The I.T.E. circuit-breakers are triple-pole and double-throw, controlling the positive, negative, and equaliser leads, and providing connection with either of two sets of bus-bars. They are equipped for remote control, but can be closed by hand ; overload time-limit and reverse-current devices are provided. The poles of the circuit-breakers are closed in the order equaliser, positive, and negative, interlocking gear being employed to ensure this sequence. I.T.E. motor-operated field rheostat mechanisms are installed, enabling the voltage of all the generators to be regulated from a central control board. In view of the importance of putting generators in parallel with others already on load without disturbing the regulation, where the generators are so large, this operation is effected with the aid of I.T.E "gyrostatic voltage balance detectors," which control the circuits of the motors closing the negative poles of the incoming generators. The detector consists primarily of a pair of switches in series with each other, and connected in circuit with the motor ; the movable members of these switches are controlled by gyrostatic governors mounted upon a vertical shaft rotated by a motor immediately below it. Whilst in use the field winding of this motor is connected across the mains of the 250-volt control circuit, while its armature is at the same time subjected to the potential difference which exists between the associated generator and the bus-bars. The direction of rotation of this armature depends, therefore, upon whether bus or generator voltage predominates, and its speed in either direction depends upon the voltage difference. By means of a specially designed clutch placed between the motor and the governor shaft, the motion of the former is transmitted to the latter only when the direction of rotation is that caused by a predominance of generator voltage over bus voltage. When rotating in the opposite direction the motor runs free. Close to each voltage balance detector is an automatic cut-out, which interrupts the motor armature circuit should the voltage difference attain such a magnitude as to produce a dangerously high speed of rotation. The lower right hand, or "low-speed" contact, is normally open, and the upper, or "high-speed" contact, normally closed. The circuit-breaker, the closing of which this apparatus controls, has three separate poles, closed in predetermined sequence. The equaliser pole is closed first, and with it auxiliary contacts which control the field and armature circuits of the gyrostat motor. Before it is called upon to function, the motor has time to assume the speed of rotation corresponding with the voltage impressed upon the armature. When the motor armature is energised in the direction corresponding to generator voltage predominating over bus voltage, the governors, which are under the control of calibrated springs, will assume positions corresponding with the particular speed of rotation, the action of the governors being independent up to a certain speed, beyond which, as the result of links connecting them with a slight lost motion, they act as a unit. It has already been stated that the rotation of the governors only occurs when the direction of voltage difference is favourable to paralleling ; when the magnitude of this voltage is such as to give the governor shaft a certain speed of rotation, then the low-speed contact is closed. The minimum voltage difference necessary to accomplish this is, in the case of the particular apparatus in question, 2 per cent. of the normal bus voltage. Should the voltage difference, however, amount to 2½ per cent. or more, the upper, or high-speed contact, is opened.

The switchboard is 424 ft. in length, and consists of 222 marble panels, each equipped with circuit-breaker, ammeter and 1,000-ampere double-pole double-throw knife switch, except a number of panels set apart for special purposes. The switchboard cost about £80,000, or £200 per foot run. There are 30 copper conductors from each machine, each consisting of a bar 6 in. × ¼ in. ; these are led to the circuit-breaker panels through a special runway, where they are secure against interference. Special precautions are taken to support these conductors firmly and to guard against buckling due to a short-circuit. All the copper is run at a working density of 750 amperes per sq. in. About 165 tons of copper was required for the whole installation.

The Ford factory has a covered floor space of 47½ acres, housing 8,000 power-driven machines. There are 178 feeders, distributing current by cables of 1 sq. in. section. Provision is made on a rack over the top of the machine shops for 90 pairs of 1-in. cable, of which 50 pairs have been installed. An elaborate signalling system has been provided, including a 200-pair telephone switchboard, connected with every distributing centre throughout the works, and with various points in the generating station. A signal board is installed consisting of four panels, each carrying 300 signal




Section of Badenhausen 4,000-H.P. Boiler.

lamps, a green lamp showing on the board when a feeder circuit is in operation, and a red light when it is not.

The prime movers were designed and constructed under the direction of the Ford Motor Co.

No information is given regarding the gas supply, but further particulars of the boiler plant are given in an article by Mr. J. P. Badenhausen in *Power*.

The author states that the problem was to obtain the highest possible output from a given volume of boiler-room space. The

existing boiler room was designed with 14 bays, each containing two boilers of 400 H.P., representing (at 50 per cent. over normal load) one H.P. per 35·44 cb. ft. of volume; the large boilers now being installed are expected to give 4,000 H.P. per bay, or 1 H.P. per 10·6 cb. ft., representing a saving in cost of buildings of £140,000, in addition to the saving in space occupied. A reduction in coal consumption of 14 per cent., equivalent to £40,000 per annum, is also anticipated. [The American "boiler horse-power" represents an evaporation of 34·5 lb. of water per hour from and at 212° F.]

The design of these boilers, the largest ever installed in the United States, was a difficult problem, involving many studies and sketches by the author.

The type considered throughout was the Badenhausen water-tube boiler, with various modifications; the design finally adopted is illustrated on p. 509. The objects aimed at were as follows:—(1) Minimum floor space. The boiler has a width of 24 ft. and a depth of 16 ft. at the floor level. (2) Maximum heating surface in available space. The boiler has 25,000 sq. ft. of heating surface. (3) Large furnace volume. (4) No soot locks. (5) Continuous unrestricted circulation. (6) Accessibility in the sense of permitting ingress into the setting, so that every tube and every baffle can be touched, cleaned and replaced by human hands. (7) Good support and suspension. (8) Dry superheated steam at any rating.

The design consists essentially of the boiler proper with an additional feed-water preheating section. Owing to the fact that the heat is absorbed more rapidly the greater the difference in temperature, it is good engineering to preheat the feed water at one stage and bring this feed water into another boiler stage where it is evaporated. The third and final stage is to superheat the steam.

Referring to the figure, the water enters drum No. 6, flows downwardly in the rear bank and enters the forward bank of tubes connecting drums Nos. 5 and 6. The gases flowing from the preceding heating surface touch one half of the tube bank and then the other; and as there is a difference of temperature in each half of the tube bank, there is also a positive circulation owing to such difference. This gravity circulation in the preheating section is an excellent feature.

After the water is heated, it passes through the horizontal tubes from drum No. 6 to drum No. 3, then drops down through the vertical tubes at the left of the bank into drum No. 1, entering from here into the general circulation. From drum No. 3 the steam flows through the tubes at the top of the setting into drum No. 4. All the moisture is thus eliminated, and the steam is slightly superheated. From drum No. 4 the steam goes into a Superno superheater, in which it is expected that a superheat of from 250° to 350° will be obtained.

The stoker is of an extra-heavy Taylor design, the grate surface approximating 21 ft. wide × 11 ft. deep.

Since the first four units were installed, orders have been received for three more boilers, all of which will be built in the plant of the Badenhausen Co.

## NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

### The "Kantark" Patent Ironclad Fuseboard.

The Midland Electric Manufacturing Co., Ltd., of Stafford Works, Barford Street, Birmingham, have introduced a new type of distributing board under the above title, for which many advantages are claimed. As shown in fig. 3, it consists of a cast-iron box in which the bus-bars are fixed behind a protecting shield, and the individual fuse elements are secured directly to the bars at one end, the body of each element being supported on teak bridge battens, which allow plenty of underspace for the main and branch cables. Each element (fig. 4) consists of a porcelain base carrying the fixed contacts, and provided with an arcing chamber, and a detachable fuse-carrier which carries the fuse wire and blade contacts. The shield is hollowed out to form the outer wall of the arc chamber, and scalloped at the sides to form ventilating slots leading from the arcing chamber (shown in section in fig. 5). The contacts in the base are covered with detachable protective shields, so that the live parts cannot be touched even when the fuse bridges are removed; the contacts themselves are solid brass blocks, provided with double set screws which clamp the circuit wires and ensure a low-resistance contact. The blade contacts are double and of ample section, and the fuse wire is fixed under a single washer and nut at each end. The arcing chamber is lined with absorbent material, and the fuse may blow repeatedly without damage. A special feature is the small number of connections between the supply cables and the circuit, the fuse being attached directly to the bar, as shown in fig. 6, which also illustrates the main cable lug, which is reversible to allow the cable to enter from the top or the bottom of the board. The outer case can be made watertight with a gasket, and the door can be fitted with a glass panel if required. Teak cases are also made, but only in one size, whereas the iron cases are made double and triple pole for 2 to 10 ways, and 10 to 50 amperes, at 600 volts. Simplicity and cheapness are included amongst the merits claimed for this device.

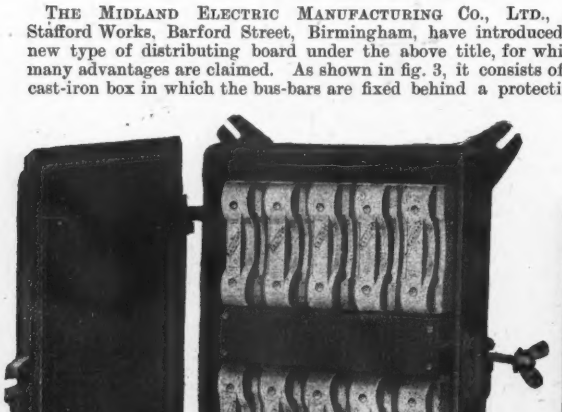


Fig. 3.—"Kantark" Ironclad Fuseboard.

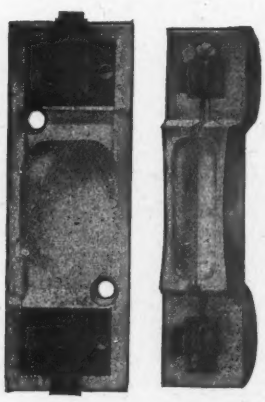


Fig. 4.—"Kantark" Fuse Unit, open.

Fig. 5.—Section of Arcing Chamber.

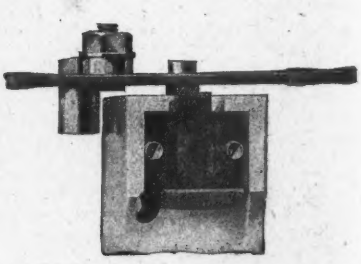


Fig. 6.—Bus-bar Connections.

### B.T.H. Instrument Transformers.

In a recent list (No. 4,591) issued by the British Thomson-Houston Co., Ltd., of Rugby, full particulars are given of their instrument transformers for circuits up to 12,000 volts.

The range of current transformers includes air, porcelain, compound, and oil-insulated types in eight different forms for varying currents and pressures. All transformers of the same ratio and form are interchangeable, and transformers of the same form but of different ratios may be interchanged if the instrument is re-scaled, the secondary windings being uniform throughout.

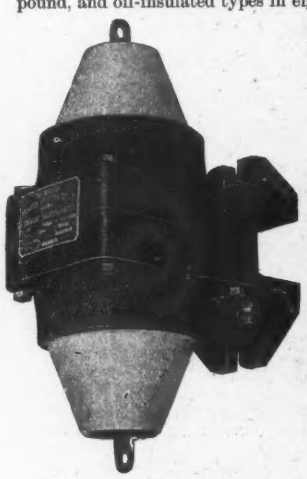


Fig. 1.—B.T.H. Current Transformer.

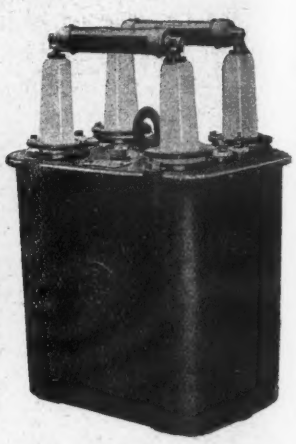


Fig. 2.—B.T.H. Potential Transformer.

We illustrate in fig. 1 a type C, form R, compound-insulated current transformer, suitable for primary currents up to 300 amperes, where the voltage between phases and earth does not exceed 4,000. The core and windings are assembled in a cast-iron case, which terminates in porcelain cones, through which the primary terminals project. The secondary leads are brought through bushed holes to special terminals.

Fig. 2 is a type VS, form AA, single-phase, oil-insulated, potential transformer, one of the series of such transformers

supplied by the company. Air-insulated transformers are supplied for pressures up to 6,600 volts, in sheet-metal casings, and oil-insulated transformers for pressures of 5,500 volts and upwards. These are in cast-iron cases with the core and windings suspended in oil. The terminals are mounted on porcelain insulators fixed to the cover. The transformers are listed complete with cartridge fuses; but for 5,500 volts and above, clips are provided to allow the substitution of expulsion-type fuses. Transformers without fuses can be supplied if required.

### A Sparkless Signalling System.

Messrs. John Davis & Son (Derby), Ltd., of All Saints Works, Derby, have brought out a system of signalling for use in mines, in which, it is claimed, the sparking danger is entirely overcome. The bell is of the makers' patent "solenoid" type, with no contact breaker, the gong being struck by an iron plunger which is actuated by a solenoid through which an intermittent D.C. or an alternating current is passed. Means are provided for adjusting the position of the gong with regard to the striker, enabling the bell to operate with a battery current or with D.C. or A.C. supply at any reasonable voltage or frequency. Obviously there can be no question of sparking at the bell. When direct current is used to actuate the bell an interrupter is provided, in the shape of a relay in a water and flame-proof cast-iron case, the lid of which fits on wide machined faces. The relay is fitted with special devices to damp the sparks at the contacts, and has a special winding to reduce sparking on the line, so that reliance is not placed on the flame-proof case for safety. The line circuit and relay can be worked off a 4-volt supply, so that dangerous sparking is practically impossible.

### Main Regulators.

Main regulators manufactured by the General Electric Co., Ltd., of London, which we have previously described, have been hand-operated, but the present example, forming part of an important contract for a large municipality, is driven by a small "Witton" electric motor; this is mounted on the top of the regulator, and is controlled from the main switchboard by means of a pair of small push switches, forming one unit, and so arranged that they cannot be left in the "on" position. There is one switch for each direction of operation and an interlock prevents both switches

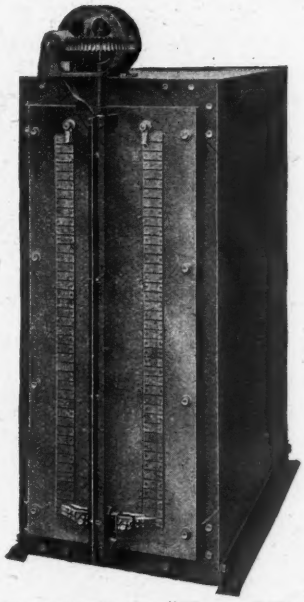


Fig. 7.—Electrically-operated "Witton" Main Regulator

being operated at the same time. To preclude damage to the motor when the main regulator control has come to the end of its travel, either at the top or the bottom, a resistance is inserted in series with the motor, and, in addition, a flexible coupling is provided between the motor and the worm driving the gear wheel. This construction avoids limit switches and is very simple and effective. The regulator itself is of the Witton rectangular pattern with grid resistance, one of a wide range of types which are manufactured by the G.E.C.

**Excess Profits Duty.**—As stated in our last issue, the Board of Referees have now given their decision in the appeal of the Melbourne Electric Supply Co., Ltd., and the Electric Supply Co. of Victoria, Ltd., under Sec. 42 of the Finance (No. 2) Act, 1915, and have increased the statutory percentage from 6 per cent. to 7½ per cent. The Crown were represented by Mr. Ernest Clarke and Mr. W. C. Stamp; Mr. W. Allen, instructed by Mr. Sydney Morse, appearing for the appellants. Evidence in support of the appeals was given by Mr. R. Percy Sellon (managing director of the Melbourne Co.), Mr. G. Saies (secretary of the Victoria Co.) and Mr. Arthur D. Bird, of Messrs. Humphreys-Davies & Co.

## CORRESPONDENCE.

*Letters received by us after* 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

### "Summation Watt" Capacity of Field Rheostats and the Like.

My attention has been drawn to the reference in Dr. C. C. Garrard's book, "Electrical Switch and Controlling Gear," *re* the "Summation Watt" formula advocated by me in the Electrical Review, page 257, February 13th, 1914, as compared with his formula.

Dr. Garrard's formula "square the mean of the maximum and minimum field amperes multiplied by the resistance of rheostat," is only true if the curve plotted between amperes and rheostat ohms is a straight line. Only for extremely short ranges is this true, and the greater the range between maximum and minimum amperes, the greater the inaccuracy of his formula.

Referring to my letter in your issue of February 26th, 1914, I showed that with a rheostat resistance of 3½ times that of the field his formula gave a rheostat size 67 per cent. greater than that actually required.

He points out that my formula, viz.:—"Rheostat ohms × max. amps. × min. amps." with "R" very large, becomes approximately equal to $I_{max} \times V$ = constant, which he states is absurd. Now, the greatest possible current range is obtained in a potentiometer rheostat where $I_{min}$ is zero. In an article dated March 26th, 1915, in the Electrical Review, I gave the correct formula for such a potentiometer rheostat as $I_{max} \times V$, plus the constant watt loss due to resistance being across excitation circuit. However, in an ordinary rheostat the constant watt loss does not exist, therefore the original formula holds good.

In practice a designer may be limited to a relatively small number of resistance units. This is particularly the case if open wire spirals are used. Then to obtain a very large "R" compared with field ohms, a much larger rheostat would be required than one wherein the unit range was not so limited; this, however, is not the fault of the formula but of the facilities at the disposal of the designer, and is no reason for advocating an incorrect formula.

Stretford, *November 2nd*, 1916. **L. Boothman.**

P.S.—I have sent a copy of above to Dr. C. C. Garrard.

With reference to Mr. Boothman's letter of November 2nd, I would point out that the various formulæ discussed are all empirical; none of them are strictly correct. When I first saw Mr. Boothman's formula I was impressed by it and endeavoured to use it; I, however, came up against the difficulties I have mentioned in my book, and therefore reverted to the formula I had previously used. Mr. Boothman has, with considerable ingenuity, worked out different formulæ giving the summation-watt capacities for the various types of rheostats. I venture to think, however, that the simple formula that I have recommended, which can be applied to any form of rheostat, is the best for all-round practical purposes. It must be borne in mind that the $I_{max}$ and the $I_{min}$ in the formula are the maximum and minimum currents flowing *in the rheostat itself*.

I am not sure that I follow the argument that Mr. Boothman gives in his letter. Taking, however, his result as given for a potentiometer regulator, he gives—

$$\text{Summation-watt capacity} = I_{max} \times V + V^2/R.$$

Now, $I_{max}$ is constant independently of the rheostat; V is also constant. Mr. Boothman's formula therefore says that the higher the resistance of a potentiometer regulator, the smaller is the summation-watt capacity. Now, as I use the term summation-watt capacity, I mean a figure of comparison of the size and the cost of the regulator. In this sense I do not think the result, deduced above from Mr. Boothman's formula, is correct. There can be no doubt that there is a certain value of rheostat ohms which gives the most economical form of potentiometer regulator, less and higher ohmic values being both worse; but Mr. Boothman's formula says that the higher the rheostat ohms, the less the summation-watt capacity.

I also do not think Mr. Boothman has answered my argument as regards his formula for ordinary shunt regulators. He re-states my argument in his letter, but I cannot see that he answers it.

I do not wish to deny the utility of Mr. Boothman's formulæ, and have no doubt that when used properly they give very useful results. I have merely wished to point out that they are not universal, and, in my opinion, must be used with caution.

To sum the matter up, the figure for the summation-watt capacity should only be used for comparing one rheostat with another; the figure has no very precise physical meaning. In my experience, the formula I have recommended gives perfectly satisfactory results, and, by reason of its simplicity and adaptability to any kind of rheostat, is to be preferred to more complicated ones.

**Charles C. Garrard.**

Birmingham, *November 6th*, 1916.

### The Prevention of Bribery.

With reference to your leading article on this subject, I wish to say that the League has always attached more importance to propaganda than to prosecutions, and it has been very active during the last ten years in its efforts to create and maintain a healthy public opinion. In one direction which you mention something has undoubtedly been accomplished—in a conference with head-

masters. The trouble is that so many in responsible positions, and persons who are training young people—to say nothing of the clergy and ministers of all denominations—pass by on the other side. Unquestionably the League could do more, but not without additional support, which I should very much like to see come from the electrical branch of the engineering industries to the same extent as from other branches.

With regard to the fiat, this is undoubtedly a hindrance to the enforcement of the Prevention of Corruption Act. There is no more danger of blackmail in this connection than in regard to any other crime. Without the fiat the public is amply protected, for it does not seem to be generally known that a summons could in no case be granted by a magistrate except on a sworn information (though the Attorney General, who can stop prosecutions, is not, judging by his speech in Parliament, aware of the fact); next, if the magistrate commits, before a grand jury and a petty jury, then an appeal may lie to the Court of Common Appeal: and lastly, proceedings may be instituted for malicious prosecution under the Vexatious Indictments Act.

**The Secretary of the**
**Bribery and Secret Commissions Prevention**
**League, Incorporated.**

London, E.C., *November 6th*, 1916.

### Between Two Stools.

Having been the victim of circumstances arising out of my acceptance of a post within the Greater London area, I feel it to be my duty to warn those of your readers who, if tempted to transfer their services from one certified establishment to another, may find themselves similarly involved.

I was privately offered a more remunerative and equally important position (my previous one being a badged occupation in a certified establishment which I had held for a number of years) which I accepted, subject to being able to obtain a leaving certificate.

This, due to the magnanimity of my chief, I obtained, but within a short time of taking over my new duties, I received a curt notification from my future chief, that owing to possible complications in which he might be involved as a result of the transfer, the engagement must be considered *off*.

Let it be clearly understood that no fresh facts had been disclosed or altered circumstances arisen between the date of my acceptance of this post and the receipt of the aforesaid curt cancellation.

I leave it to the imagination of your readers to supply the details to complete the picture, and offer them my advice: Don't be tempted by private offers unless completely assured that you are dealing with persons alive to the responsibilities vested in the higher commands, and not with those unscrupulous enough to sacrifice the career of a subordinate on the altar of their own irresponsibility.

**Victimus.**

## LEGAL.

### High-speed Telegraph Patent Extended.

In the Chancery Division, on Wednesday, November 1st, Mr. Justice Sargant heard a petition for the prolongation of a patent granted to Fredk. George Creed and Wm. Arthur Coulson for improvements in high-speed automatic telegraphy, with the object of reproducing telegraphic messages in printed characters.

Mr. Creed gave evidence that since 1896 he had devoted himself to the problem of making high-speed telegraphy automatic, with the object of dispensing with the skilled telegraphist. About 1906, the late Lord Kelvin became interested in his keyboard perforator, and used his influence with Lord Stanley, the then Postmaster-General. Witness gave a demonstration at the Post Office, with the result that they gave him an order for ten printers and six receivers. The witness described the different steps which led to the introduction of the latest machines.

The Solicitor-General (Sir George Cave, K.C., M.P.) said he was not there to oppose the petition, but merely to assist the Court. In these cases it was of the greatest importance that petitions should not be extended beyond the statutory period. He thought that this was a very special case. The petitioner must show that his invention was a meritorious one, and that he had not been sufficiently remunerated owing to no fault of his own. But he recognised the merit of this invention.

His Lordship said that, owing to circumstances over which he had no control, the patentee had not been able to push the invention in the way he might have done. He proposed to grant an extension of seven years, not to exceed five years after the termination of the war. As the patent had expired on October 17th, he granted a new one for the period mentioned.

### Tube Railway and Compressed Air.—The Arbitrator's Award.

Mr. Alexander Ross, President of the Institution of Civil Engineers, as arbitrator, has issued his award touching a difference between the Postmaster-General and the Great Eastern Railway Co.

The matter was reported in our issue of October 20th.

The Arbitrator, in his award, states that "having heard counsel and witnesses for both parties, and having examined that part of Liverpool Street Station under which the intended works will be executed, and also the works on each side now being executed by the Postmaster-General, he affirms and awards that it is not necessary to used compressed air in carrying out the works."

### British Power, Traction and Lighting Co., Ltd., *v.* Hodgson.

On Monday last, Mr. Justice Peterson, in the Chancery Division, concluded the hearing of a summons in this action, by which the plaintiff company asked that the defendant, A. E. Hodgson, might be ordered to pay into Court the sum of £7,563, in accordance with the certificate of the Master dated July 20th, 1900.

The case, as stated by Mr. Hughes, K.C., for the plaintiffs, was that the defendant was a promoter of the company, chairman of directors, and a managing director, and without the knowledge of his co-directors or other members of the company entered into contracts which amounted to fraud or fraudulent breach of trust. The action was started in 1903, alleging, amongst other things, that at defendant's suggestion the company paid commissions to a syndicate, whereas the defendant himself was the syndicate and benefited by the commissions so paid, and that he negotiated a contract in France for the company while he had himself a contract on more favourable terms. Judgment was given for the plaintiffs in the action by consent on May 2nd, 1905, Mr. Hodgson having become a bankrupt during the course of the proceedings. He had now obtained his discharge, and the present summons was issued, alleging that as the finding of the Master was based on a judgment in an action for fraud or fraudulent breach of trust, he was not protected by his bankruptcy in respect of the amount found due by the Master's certificate.

Mr. Tomlin, K.C., for the defendant, argued that he only consented to judgment on the understanding that all charges of fraud were withdrawn, and that the plaintiffs' rights should be to prove in his bankruptcy for any sum that might be found due under the order. If the judgment was one based on fraud, he said the defendant would take steps to have it set aside, on the ground of mistake on the part of his legal advisers, as he had all through refused to settle the case unless all charges of fraud were withdrawn.

In reply to the contention, Mr. Hughes pointed out that the receiver in bankruptcy had taken no steps before the Master, but the proceedings had been attended by the defendant personally.

His Lordship held that the judgment in the action was based on fraud, and nothing else; and that, therefore, the defendant was not protected by his bankruptcy. He accordingly ordered him to pay the amount found due into Court, and the costs of the action. The order would, however, be stayed pending an appeal and a summons the defendant might issue for further time, in view of his taking proceedings to set aside the order of May, 1905.

## DUBLIN ELECTRICITY SUPPLY.

In a report of the Special Committee appointed by the Dublin Corporation to inquire into the administration of the Electricity Committee and matters relating thereto, it is stated that, having considered the report of Mr. Patrick W. d'Alton, M.Inst.C.E., the expert consulting and inspecting engineer appointed to examine and report upon the questions involved, it has been resolved, by eight votes to one, to recommend that the Town Clerk write to Mr. d'Alton asking him upon what terms and conditions he would undertake the entire management of the undertaking during a period of three years.

The Special Committee was appointed as far back as April, 1915, and on August 7th requested Mr. d'Alton to make a thorough investigation of the Dublin electricity undertaking from its inception to the present time, and to report on ways and means of rendering it more profitable to the city. In December last, after making an exhaustive study of the history and constitution of the undertaking, Mr. d'Alton submitted his views to the Council in a very full report, parts of which were published in the local Press in February, without the authority of the Corporation.

Mr. d'Alton's report, and replies thereto by Mr. Ruddle, city electrical engineer; Mr. Kettle, deputy engineer; Mr. F. Allan, secretary of the Electricity Committee; and Mr. Mangan, city accountant, are now officially published. In a supplementary report, Mr. d'Alton states that he has now an opportunity of bringing his original report "into truer perspective than that into which it appears to have drifted as a result of premature and incomplete publication," and of the premature and also incomplete publication of other reports written with, he doubts not, perfectly sincere motives to discount his conclusions.

The questions to be reported upon were, besides administration, the prices charged for light and power; the number of engineers and workmen employed and paid out of revenue; the salaries and wages paid out of revenue; the procedure adopted with regard to purchasing coal; charges for interest and repayment of moneys borrowed; and the question of additional borrowing. The following is an abstract of the report:—

Referring to the difficulties with which all electrical undertakings had to contend in the early days of electricity supply, Mr. d'Alton remarks that no useful purpose would be served

by dealing with the troubles experienced at Dublin prior to the erection of the generating station at Pigeon House Fort and the adoption of a three-phase system of distribution to sub-stations at 5,000 volts, under the advice of the late Mr. Robert Hammond.

The Pigeon House Fort site was adopted, "possibly for political reasons," against the advice of the city electrical engineer, Mr. Mark Ruddle, and of Sir Alexander Kennedy, and its selection, says Mr. d'Alton, cannot be justified; it was a mistake of great magnitude, for which the economy of the undertaking must suffer throughout its existence. It has involved much additional capital expenditure, increasing the cost per unit, and has caused losses in transmission, in time spent by the staff in travelling to and from so inaccessible a place, and in money spent in transport of material, besides duplicating centres of control and necessitating an increased staff of workmen. The mistake might have been retrieved when the installation of modern generating plant was being considered, but the opportunity was not taken, and Mr. d'Alton does not regard the question of changing the position of the power house as falling within the scope of his inquiry.

Reviewing the conduct of the undertaking, the author highly commends the enterprise, ability, and loyalty of the successive Electric Lighting Committees which have so well served the undertaking; under their guidance the output has increased from 3,000,000 units sold in 1906 to more than 9,000,000 in 1914-15. But the distribution of the sales over the day has not been equally satisfactory, and unless the motive power and long-hour lighting connections are developed, the load-factor cannot be so improved as to enable the engineering staff to generate electricity at a reasonable cost.

Large numbers of gas engines are used in the city which should be replaced by electric power; the curve of power output itself indicates by its steepness that there is plenty of scope for development of the motor load, provided that expert engineers are employed as canvassers. At present the undertaking is controlled by a chief engineer who is not a manager, and a manager who is not an engineer; Mr. d'Alton holds that the engineer of such a system should be manager as well, and as such should be held responsible for the successful conduct of the business from start to finish.

The average price charged for electricity in Dublin (2.66d. per unit) is easily the highest of the 14 undertakings which have an output for private supply and public lighting only (no traction), exceeding 6,000,000 units a year (1.76d. per unit). Mr. d'Alton points out that the rates for private supply in Dublin are unduly high, and that a reduction would increase the demand, improve the load factor, and benefit the service with profit to the city; "it is generally the case that the revenue from new consumers under a reduced rate counterbalances any loss by such reduction to old consumers in any given year."

Turning to the power station, Mr. d'Alton says it is difficult to understand how, even 15 years ago, so large a scheme should have been provided with a power house incapable of adequate extension and equipped with so little generating plant; the result has been heavy expenditure on alterations and reconstruction. The Stewart engines originally installed were probably of a type as good as any then available, but were a constant source of trouble, and were not taken over for several years after their installation. No steam consumption figures were asked for or taken, but the engines were condemned on defects of construction, and were partly reconstructed by the Oerlikon Co. A Belliss-G.E.C. set of 1,500 KW. capacity was added in 1906, but does not seem to have turned out to be an economical steam unit. With the original generating sets were installed four Babcock and six Lancashire boilers; Mr. d'Alton cannot understand why the latter were included, and says they must have cost the ratepayers a large sum of money for repairs, maintenance, stand-by losses, and steam for forced draught. The city electrical engineer was in no way responsible for the situation or equipment of the power house, which apparently, when he took charge of it at the end of Mr. Hammond's connection with the job, he considered to be little better than a scrap heap.

In 1907 a Richardsons-Westgarth-G.E.C. turbo-alternator of 1,500 KW. was installed, which until 1911 was by far the most economical unit in the station. This set was ordered by the Corporation in defiance of the recommendations of the Lighting Committee and the advice of the engineer, neither of the makers having previously built machines of that type and size.

The set, however, though economical, was used only to carry the peak loads until 1912, when the new portion of the power house was placed in commission. Two Oerlikon sets of 3,000-KW. capacity were installed, one at the end of 1911, and the other last year. Mr. d'Alton states that the low-pressure guide disks of the first of these turbines are in very rough condition, and the metal may later on have to be changed to prevent loss of efficiency.

Indicator diagrams from the reciprocating engines show that the high steam consumption is due not to wear of parts, but to imperfections of design, and to the extremely low vacua obtainable from the defective condensers. The latter "are wrong, all wrong, and have been so ever since 1906."

The tubes have been subject to a curious corrosive action, which has resulted in leakage so serious that the condensate cannot be used for feed water, thus adding to the coal consumption, already excessive on account of the low vacuum. Mr. d'Alton has had tubes examined and the water analysed by experts, and believes he is on the point of success in discovering the cause of the trouble, to which he ascribes great importance. He regards the Oerlikon sets as generally excellent. The switchgear consists of Ferranti cellular gear, which has done, and still does, good service, and modern cubicle switchgear of satisfactory design, but, unfortunately, the latter has had to be fixed at odd angles and levels owing to the design of the building. The control gear in the new station is well schemed on modern lines.

The boiler houses "contain a miscellaneous collection of steam makers, planted apparently without any regard to considerations of keeping steam ranges within rational limitations, of economy in the disposition of feed pipes, of coal-carrying apparatus, or of the evacuation of ashes." The plant comprises four B. & W. boilers of 10,000 lb. rating, six Lancashires of 3,500 lb. capacity, one B. & W. of 20,000 lb. capacity, and a Yarrow boiler, of which little use has been made, and which appears to partake of "the qualities and reputation of the white elephant." There are also four new B. & W. boilers of efficient and up-to-date design. Why the Lancashires were installed in a station designed for a peaky lighting load, Mr. d'Alton is at a loss to understand; their use has led to serious loss due to the quantity of coal wasted.

In 1905-6 the consumption of coal was 7.98 lb. per unit generated, suggesting an over-all consumption of "no less than 40 lb. of steam per KW.-hour, a wretched result." The loss due to the bad vacuum (less than 20 in.) implies an increased steam consumption of at least 20 per cent. The Belliss 1,500-KW. engine is much more economical than either of the 1,000-KW. Stewart sets, and ought to be worked always in preference to the latter, but has not been used nearly so much as it should. Similarly the Richardsons-Westgarth-G.E.C. set, which is far more economical than the Stewart sets, was used only for 40 to 50 hours weekly during the first two years.

Mr. d'Alton is "at a loss to understand why the staff continues to show preference for the old Stewart sets," which have been used consistently, winter and summer, for many years, with grave prejudice to the coal bill and the running cost. He points out that the modern efficient plant, in both boiler and engine rooms, ought to be employed on the daily load and the old machinery only, if at all on the peak or in emergency. The practice that has been followed of using extravagant plant most of the time, and saving the efficient plant for emergencies, is one of the primary reasons for the high cost of production. For the year ending March 31st, 1913, the following ratio resulted:—

| | |
|---|---|
| Units, old plant to new ... ... ... | 2.46 : 1 |
| Coal used, old plant to new ... ... ... | 3.47 : 1 |

The total steam consumption of the Oerlikon sets is very much less, even at one-third load, than that of the best of the older sets at its maximum rated output, and, had they been fully utilised, the saving in coal would have amounted to nearly £3,000 in the year above mentioned. A consideration of the results obtainable by using the most efficient of the boilers and generators leads Mr. d'Alton to the conclusion that an annual saving of no less than 7,974 tons of coal, costing at present prices £9,000, could be effected.

"The operation of the boiler house is characterised by the same curious policy as that which has been evident in the engine room, viz., the constant use of extravagant plant while efficient and economical boilers are held in reserve for peak and emergency loads." The 24,000-lb. Babcock boiler, which is equal in output to three or four Lancashires, is apparently used only for about one day per week on the average. The steam used for forced draught alone for the Lancashire boilers is said to have cost some £500 a year.

No fault is found with the constitution of the running staff in point of numbers, though Mr. d'Alton noticed evidence of slackness on the part of the shift engineers, particularly in the boiler house, and the wages paid, except in the case of the deputy works superintendent, are adequate. Mr. d'Alton considers, however, that the pay allotted to the engineer in charge of generation and the deputy works superintendent is insufficient to attract such a class of engineer as is required for the satisfactory operation of so large a system. The old plant requires a larger staff than will be necessary when the turbines are being fully utilised, and it should not be worked merely to give employment to men who would otherwise be unnecessary. In other respects economies in labour are foreshadowed.

The total wages at the power house (excluding the engineer in charge) amount to more than £10,000 a year, an outlay which Mr. d'Alton considers exceedingly heavy for such a station. The generating engineer is handicapped by the want of adequate power and authority over the employés, and is unable to clear out hangers-on.

As regards the distribution system, Mr. d'Alton regards the plant as satisfactory in all respects, except that about twice as many sub-stations have been established as would appear necessary. Unfortunately, the mains are not utilised as fully as they should be. The occurrence of serious discrepancies between the official returns for units generated, units sold, &c., and the actual figures recorded at the power house induced Mr. d'Alton to have the watt-hour meters at the station tested at Trinity College, and led to the discovery that some of them were in such bad condition that their indications were unreliable, the errors amounting in some cases to as much as 30 per cent. low, so that the actual output could

only be guessed at. Making approximate corrections, it appears that the units unaccounted for amount to more than three millions, or about 25 per cent. of the units delivered to the feeders. The loss would have been less but for the excessive multiplication of distributing points. The staff engaged upon distribution and installation work appears, to Mr. d'Alton, to be unduly large compared with the duties discharged. The system suffers severely from the lack of a highly qualified sales engineer. The permanent employés number 69 persons, with a total pay roll of £5,800 per annum, and 50 temporary employés, at £2,875 per annum, making a total of £8,675 a year; including the staff and clerical workers, the total is nearly £12,000 a year. Of this about £4,263 is charged to revenue, and about £7,740 to capital account. The wages of the secretarial section amount to about £3,300 per annum.

The coal supply seems to have become a monopoly, as for many years it has been in the hands of one firm of contractors. The price, says Mr. d'Alton, is very high, and he comments on the surprising fact that, in spite of widespread advertisements in the Press for tenders for a possible 52,000 tons for 1914-15, only one firm submitted an offer. Efforts should have been made to ensure competition in a matter of such vital importance. Moreover, the specification did not adequately define the class and quality of coal to be supplied, and the fuel has shown wide variations in calorific value.

The undertaking has been burdened with heavy charges for interest and repayment of loans upon an exceptionally large capital outlay per kilowatt. Whereas the average capital charges in the cases of the 14 undertakings previously mentioned are 0.8d. per unit, in Dublin they amount to 1.3d.

In order to prevent a deficit on the working of the system in the current year (1916), Mr. d'Alton says that strenuous efforts will be necessary to reduce the costs of production. All the generating sets should be put in perfect order before the autumn, and an additional turbo-alternator should be put on order if it were possible. Extension plant will be necessary for the winter of 1917, costing probably £50,000, and the next generating set should be of greater output than any as yet installed.

Mr. d'Alton concludes his report with a summary of the conclusions at which he has arrived on the basis of the investigations which he has made.

Asked to comment on Mr. d'Alton's report, Mr. Mark Ruddle, City Electrical Engineer, says that none but those responsible for the conduct of the undertaking can realise the difficulties which have had to be surmounted in the daily working of the plant. He refers to Mr. Kettle the parts of the report dealing with the working of the generating plant, but claims that the Lancashire boilers are as economical as the water-tube types, and states that as the Yarrow boiler was specially installed as a stand-by in case of emergency, it would have been absurd to use it in the regular working of the station. The comparison between Dublin and other places is, in his opinion, fallacious owing to the differing local conditions; moreover, the units sold for power have in six years increased four and a half times, but the load factor has only increased from 13.4 to 14.5 per cent., and while the power output is 47 per cent. of the total, it produces only 22 per cent. of the total income, whereas the lighting load, 5 per cent. of the total, produces 78 per cent. of the income. He disagrees with Mr. d'Alton's suggestion that the units used on the works should be deducted from the total units generated before estimating the percentage of units lost in transmission, but endorses his statement that the city electrical engineer should have full responsibility for the selection and control of the staff. He holds that the rates of charge for private supply are not excessive, citing a report by Mr. Pearce in 1911 in support, and disputes the figures given in the report as expended in wages for distribution. Objecting to a more rigid specification for coal as likely to inflate prices and limit competition, Mr. Ruddle urges the necessity of procuring an underfeed stoker already asked for, and approves of the immediate provision of an additional generating set. Finally, he does not agree with the sweeping condemnation of the Stewart engines, or the recommendation to use the large water-tube boilers for the daily load and to hold the remainder in reserve.

Mr. H. Mangan, City Accountant, says he fears that the conditions of supply in Dublin must be inherently unfavourable to any remarkable development in the load factor, which has remained persistently low for many years, but concurs with Mr. d'Alton's suggestion that potential consumers should be canvassed by competent technical assistants. Regarding the prices charged, he demurs to their reduction below cost in the hope of developing a better class of supply, and points to the effects of high prices of coal, &c., upon the costs of production; if the savings indicated by Mr. d'Alton materialise, a reduction in price should not anticipate, but follow them. He criticises the comparison drawn between Dublin and other cities as worthless and misleading in the absence of details as to the relative proportions of the power and lighting supplies, but refers to the reluctance of the Electricity Department to allow a fair price to the Main Drainage Department, whereas a much cheaper rate has recently been allowed to a Government Department for a much smaller supply. He had already (in 1909) drawn attention to the high cost of coal per unit, and supports Mr. d'Alton's criticism of this item. The Board of Trade form provides no space for "losses in transmission," but these can be shown in future. He deprecates the practice of paying the salaries of permanent officials engaged on extension works out of loans instead of out of revenue, and again recommends that loans for meters should be short-term loans in view of the short lives of the apparatus.

Mr. F. J. Allan, Secretary to the Electricity Supply Committee, complains that Mr. d'Alton did not visit his department before preparing his report, and claims that there has been no lack of effort on the part of the sales office to spread the use of electricity, pointing out that Mr. d'Alton fully acknowledges the rapid development of the load, which dated from the inauguration of the Commercial Sales Department in 1907. He gives figures illustrating the steady improvement in the output for lighting and power respectively, and states that the former unbusinesslike methods of dealing with the public have been completely removed. The "bitter prejudice which existed for years against the Dublin Corporation electricity undertaking" has at last been brought down to comparatively narrow limits. Complaints are best dealt with by an official in constant touch with the Committee. There is no dual control, and the departments co-operate in a whole-hearted manner; the account clerks and meter readers must work together, and with the canvassers. No alterations in prices have been made without careful consultation with the Committee and Mr. Ruddle, and the rates are not excessive for Dublin. The number of power users near the lines of mains still unconnected is very small. The number of meter readers cannot be reduced, and it is difficult to see where a saving in the cost of the secretarial department can be effected.

Mr. L. J. Kettle, Deputy City Electrical Engineer, in a lengthy report on the points concerning the generating works, draws attention to the improvement in coal consumption in 1906-7, for which he claims the credit as the result of long hours of work; he was engaged to effect certain economies, and considers that he more than made good his guarantee. The 3,000-kw. set could not have been run in 1912-13, as suggested, owing to the lack of a steam-pipe connecting the old and new stations, there being a coal store between the two; there was only one feeder between the new plant and the city supply, and the new switchgear had not been installed, while the two new Babcock boilers could not be run continuously owing to a mistake in design. Even if the plant could have been run, the economy suggested by Mr. d'Alton would not have been realised, as the set could not have been kept fully loaded, and the old plant could not have been completely shut down. At a load of 500 or 1,000 kw. the old engines are more economical than the 3,000-kw. turbine. Mr. d'Alton's figures for steam consumption, he says, are wrong, and the low load factor is the main cause of the high generation costs. Even if up-to-date plant were installed, the costs could not be reduced "in a dramatic and sweeping manner" if the external conditions were not radically improved. If an additional 5,000-kw. set and new boilers are installed and the 3,000-kw. sets overhauled, they can shut down the old plant and show a considerable reduction in the costs. Continuity of supply is more important than a small economy with risk of interruption. He was hampered in laying out the plant by the limited ideas of the authorities. He defends the method of running the boiler plant, and points out that Lancashire boilers are unsuitable for getting up steam in emergency, whereas the Yarrow boiler can be put in service in one hour. Corliss engines compare very favourably with turbines in point of economy and reliability; those they installed were not the best of their kind, but were good value for the money, and had saved the situation more than once. The Belliss & Morcom engine needs overhauling, and the grease extractor should be removed; the Richardsons-Westgarth turbine may be reconstructed when more plant is available. No great loss has been incurred through the faulty condensers, and the figures Mr. d'Alton gives for increase of consumption of steam per inch of vacuum lost relate to turbines, not to reciprocating engines. The meters are not inaccurate, and should have been tested *in situ*. With regard to the coal supply, he is anxious to increase the competition, and to install a furnace which will enable a wider range of coal to be employed, but he disagrees with Mr. d'Alton as to the quality of the coal supplied, and as to the adoption of a more rigid specification.

In the supplementary report submitted by Mr. d'Alton at the request of the Committee, he states that he has no intention of defending in any way the views which he put forward in the original report, and sees no reason to depart from the conclusions then attained. He is satisfied that the administration is capable of improvement, and that economy is practicable without prejudice to the efficiency of the service. He stands by his comparison between Dublin and other places, and is convinced that only the lighting most important to the consumers has yet been connected, while the lighting most important to the undertaking (that of the long-hour consumer) has not been encouraged as it should have been. He did not make the statement that the wages spent on distribution amounted to £12,000 per annum; with the exception of what was paid for public lighting, the charges under the head of distribution were not unduly high, but there is no sufficient justification for the large proportion charged to capital. He fails to see how a more rigid coal specification could produce a more limited competition than at present, when the number of competitors for the Dublin contract amounts to one. The reduction in coal consumption

in 1906 and 1907 did Mr. Kettle credit, but emphasised the bad engineering of the station as he found it. Mr. d'Alton insists that the turbines are greatly superior in economy to the old engines, and maintains that "the sacrifice of efficiency on the altar of superprecaution is not the highest practice of a responsible engineer"; in many municipal stations engineers have overdone security and sacrificed economy. The merits of the turbine cannot be questioned; Corliss engines are never installed nowadays, and those in the power-house gave endless trouble. The condenser trouble at the Pigeon House, if not absolutely novel, is not a common one; Mr. Kettle's views on condensers will not find many supporters, and Mr. d'Alton states that he was not thinking of turbine practice when discussing the vacua on the Corliss engines. The Oerlikon turbine was run for 2,300 hours, showing that the absence of a steam-pipe and the availability of only one feeder were not insuperable obstacles to its employment; he is satisfied that the turbine could have been run on a load of 1,000 KW. for a much longer period than Mr. Kettle states, and that the question of load factor has no bearing on the case. If the Yarrow boiler is used only for peak loads and emergencies it may have a long life, but not a useful one. He did not advocate the employment of the Lancashire boilers for emergency work, and cannot accept the view that this type can compete in efficiency with the water-tube type. Mr. Kettle's comments on the difficulties put in his way in the attempt to improve the boiler-house plant confirm Mr. d'Alton's views, and demonstrate the bad conditions under which the plant is operated. The size of coal should be specified, and the coal delivered should be tested; various sizes of coal from the same seam will not yield the same B.TH.U., and 10,500 B.TH.U. is too low for "washed single nuts"; the slack should give that value, and a pure washed "single" will give 1,000 B.TH.U. more than the slack from its own seam. Moreover, the specification does not name any colliery or district, and both the heat value and the price vary considerably with the district of origin.

Mr. d'Alton describes Mr. Mangan's report as courteous, interesting, and helpful, though he cannot agree with all that he says. He is informed on good authority that an active forward policy would double the present output in a short time, and the gas company has, in fact, adopted such a policy with success. He is well aware of the amount of work done by Mr. Allan and his "live" department, but is none the less convinced that such an undertaking must be administered by an engineer. By way of comparison, Mr. d'Alton cites the case of Poplar, where the output for 1914-15 was about 30 per cent. greater than that of Dublin, but the expenditure on salaries and commissions, under the management of an engineer, was £4,159, whilst that of Dublin was £7,862. He cannot understand Mr. Allan's reference to the "bitter prejudice" existing against the Dublin electricity undertaking.

The various reports and the Special Committee's recommendations with regard to the offer to Mr. d'Alton were expected to come before the Municipal Council at its meeting on Monday last, but were not mentioned, and it is now supposed that they will be dealt with at a special meeting.

## WAR ITEMS.

**Exports to China.**—The "London Gazette" for November 7th contains further names of persons and bodies to whom exports to China and Siam may be consigned.

**Enemy Businesses in India.**—The "Board of Trade Journal" for November 2nd contains a list of businesses being carried on in India by hostile firms which the Governor-General in Council has ordered to be wound up.

**Belgian Power Plant Sent Into Germany.**—"Les Nouvelles," the Belgian paper published in Holland, reports that the Germans continue to take possession of factories on the Meuse. All the machines belonging to one power company have been sent to Germany.—*Times.*

**German Trade Unions.**—Since the beginning of the war the German trade unions have lost 60 per cent. of their members. In June, 1914, the membership of the unions amounted to 2,482,046, but by the end of 1915 this number had dropped to 982,863.—*Times.*

**To be Wound Up.**—The following further companies have been ordered to be wound up under the Trading with the Enemy Amendment Act:—

Bosch Magneto Co., Ltd., 204, Tottenham Court Road, W., manufacturers of magnetos. Controller: A. E. Woodington, 5, Philpot Lane, London, E.C.

British Incandescent Mantle Works, Ltd., Ravensbury Road, Earlsfield, manufacturers of incandescent gas mantles. Controller: T. Wise, Bassishaw House, Basinghall Street, E.C.

**Enemy-owned Electrical Shares.**—In the House of Commons, last week, Mr. George Terrell asked whether the enemy-owned shares in the Enfield Electrical Cable Manufacturing Co., Ltd., had yet been sold by the Public Trustee, and, if so, to whom and for what price. Mr. Pretyman replied that the Public Trustee informed him that he was carrying on negotiations for the sale of the enemy-owned shares in this company, but he had not yet effected a sale.

**Government Order Regarding Motor Construction Work.**—The Minister of Munitions announces that as from November 15th, he prohibits until further notice any person, firm, or company engaged in the manufacture or repair of any vehicle designed for mechanical transport or traction, or any part of such vehicle, from carrying out in any factory, workshop or other premises, without a permit issued under the authority of the Admiralty, the Army Council, or the Minister of Munitions, any work consisting in the manufacture, assembling, or erection of any new or unused motor internal-combustion engine, designed or adapted for mechanical traction, or of any new or unused motor cycle, motor chassis, motor wagon, or of any tractor or other motor vehicles of any kind propelled by mechanical means, subject, however, to the exception of work required to complete contracts placed by the Admiralty, the War Office, the Minister of Munitions, or an Allied Government, on or before the date of this order.

**The Manufacture of Copper Wire and Cables.**—The Minister of Munitions announces that, in exercise of the powers conferred upon him by the Defence of the Realm (Consolidation) Act, 1914, the Defence of the Realm (Amendment) No. 2 Act, 1915, the Defence of the Realm (Consolidation) Regulations, 1914, and all other powers thereunto, enabling him, he hereby prohibits as from the date of this Order, the manufacture of any copper wire or any cable containing copper, except for the purposes of any of the following contracts or orders for the time being in existence, namely:—

1. A contract or order to which there shall have been allocated by the Priority Branch of the Ministry of Munitions a reference number and priority classification within Classes "A" or "B" of circular L. 33 as to control of output issued by the Minister of Munitions on March 31st, 1916, or:

2. A contract or order with and bearing the reference number and identification letters of any of the following departments, namely: The Admiralty, the War Office, the Ministry of Munitions, and the Post Office.

**Messrs. Dick, Kerr Purchase A.E.G. British Interests.**—We reproduce the following from the *Times*. We comment upon the matter in our leaderette pages:—

"We learn that the business of the A.E.G. Electric Co., one of the three subsidiaries in this country of the Allgemeine Elektricitäts Gesellschaft, of Berlin, has just been sold by the controller appointed by the Board of Trade to Dick, Kerr and Co., Ltd., whose electrical works are at Preston.

"The A.E.G. Electric Co. was the most important of the three subsidiaries, and had offices and depôts in London, Newcastle, Cardiff, and Birmingham. It had undertaken large contracts for leading colliery and shipbuilding companies, and one of the reasons advanced for the continuance of its operations after the outbreak of war is understood to have been the importance of the work it had undertaken for firms engaged on British Government contracts. The contracts varied in value from £1,000 to about £40,000, and the liquid assets held in this country amounted to well over £100,000. It is understood that as these assets are now transferred to the Public Trustee, practically all that was saleable, apart from stock, was the goodwill, and that as the company's profits have naturally fallen off during the war, the price paid was not large. Before the war the company employed an army of German mechanics, and the whole of the capital was held by the parent company in Berlin. During the war the German staff is stated to have been replaced by a British staff, and the latter is now taken over by Dick, Kerr & Co., together with a number of uncompleted contracts. The Controller, Mr. Maurice Jenks, of 6, Old Jewry, E.C., was appointed by the Board of Trade on July 7th last, and now, having effected the transfer of the German business in its entirety to a British firm, he ceases his connection with the company, except, it is understood, for the collection of certain debts.

"The controller for the Electrical Co., Ltd., one of the two other subsidiaries in this country of the German concern, was appointed by the Board of Trade on March 9th; an order was issued at the end of July for sales to cease; and on October 17th the residue of the stock was disposed of by Messrs. Wheatley Kirk, Price & Co. Its head office was in the Charing Cross Road.

"The third subsidiary is the A.E.G. Electric Co. of South Africa. Its business here is stated to have been confined to arranging contracts for electrical apparatus with the South African mines. The controller was appointed on July 7th, and the intention is to close down the business in this country very shortly. The stock in South Africa is being dealt with by the Union Government under recent legislation."

The Electrical Co., Ltd., the A.E.G. Electrical Co. of South Africa, and the A.E.G. Electric Co., Ltd.—Notices appear in the *London Gazette* for November 7th to the effect that these businesses having now been sold and disposed of, or the companies having ceased to carry on business in the United Kingdom, creditors who have not yet sent particulars of their claims, &c., to the controller, Mr. Maurice Jenks, 6, Old Jewry, London, E.C., must do so by November 30th. In each case a paragraph is added to the notice intimating that all persons having in their possession any property or effects belonging to the companies must deliver same to the controller forthwith, and all debts due must also be paid to him.

**Tramway Service or the Factory?**—Before the Huddersfield Munitions Tribunal, last week, Henry Oldham, a local tram conductor, claimed that the Corporation were unreasonably withholding his leaving certificate. He had taken on the conducting work temporarily, having been a finisher's cutter at a local factory, which he had had to leave owing to shortage of work last November. He had since been twice asked by the firm to go back, and about a month ago he gave the Corporation a fortnight's notice and went back to the factory. He had only been there a short time when, owing to correspondence between the factory-owners and the tramways manager, he could not be kept by the firm. He held that he would be doing work of greater national value by going back to his old job, as conductor's work could be done by women. Mr. Proctor (Deputy Town Clerk) said the man could not be spared. The department had 82 male and 64 female conductors, but 18 of the men were to be taken into the Army in a few days, and the male conductors also formed the reserve from which to draw drivers. Mr. Wilkinson (tramways manager) said he had had only one application from a woman as conductor within the past month, and it was now impossible to get women. When the 18 male conductors went to the Army the tramway service would have to be reduced. Mr. Proctor said a decision by the Tribunal was important, as several other men similarly placed desired to leave the tramways department. The Chairman said the question was whether it would be in the national interest that the man should work in the factory or remain in the public service. The Tribunal must refuse the application.

**Exemption Applications.**—At Woking Tribunal, the Woking Electric Supply Co. asked for leave to appeal for J. S. Fowler (23), single, an electric wireman. The Clerk said the application was out of date, and the Tribunal refused to hear the application. Mr. E. G. Nicholson, the secretary of the company, gave notice of appeal.

At the Yarmouth Tribunal, an ironmonger and electrician appealed for his only electrician (36), without whom, he said, he could not carry on his business. He was the only man of military age in his employ in this department, five having gone. Conditional exemption was continued.

At Dover, on November 1st, the Town Council applied for the retention of the driver of an electric scavenging vehicle (32). A month only was granted.

Eleven motormen and one inspector were appealed for at Brighton by the Corporation. Mr. Marsh, in reply to a question, said that women could be employed as drivers on the Lewis Road route, but not on the hilly route. Now only 63 men were employed, and if 12 went it would be a serious matter. Sir John Blaker, the Military Representative, said it was a bad example to see such a large number of eligible men employed on a Corporation undertaking. All the men appealed for were under 33, and two of them were unmarried. It might mean a less frequent tram service, but this the inhabitants would be quite willing to put up with. Twenty years ago they did without trams, and now, in this crisis, he thought that all the men should go. Mr. Marsh replied that 214 men had enlisted from the depôt, a percentage of 72 of the whole staff, and no tramway service in the country had a better record; Torquay coming second. Two single motormen and the inspector, also single, were each given a final two months, and the others three months each.

An electrician at Lindfield was appealed for by the Crawley Electric Light Co. at a sitting of the East Sussex Tribunal, exemption having been refused locally. The man, it was stated, was responsible for overhead cables, and was necessary for the public safety. Although deaf, and having a deformed chest, he was passed for general service. Exemption was not allowed.

Before the Surrey Appeal Court, on October 28th, the Military Representative appealed against exemption given to Mr. Morgan, of the Reigate municipal electric light staff, who had been given until January 1st by the Reigate Tribunal. The Court made the exemption allowed final.

At Worthing, an electrical engineer, who was for a time a voluntary munition worker, appealed, and stated that he was released from the work because he was liable for military service. His appeal for exemption was rejected.

A Hove electrical engineer, left with only one man, and who said that the business could not continue if he had to serve, has been given two months' exemption.

At Aylesbury, a firm of electrical engineers, with premises at Kingsbury, applied for the retention of their electrician and confidential clerk. The former, passed in Class C 1, was given six months, and the latter, fit for general service, was directed to be called up on December 1st.

At Kidderminster, the Tramway Co. appealed for two motormen and a car-shed foreman, and five months were allowed to each.

Warwickshire Appeal Court has given exemption until a substitute is found by the military to Mr. A. L. Smith (27), electrician, appealed for by the Stratford-on-Avon Electricity Co., Ltd.

At East Ham, the Broadway Cinema Co., Ltd., appealed for their electrical engineer, S. C. Potter (26), who works the generating plant, but the appeal was dismissed, and a month's delay granted.

At Pontefract, Mr. J. L. Brown (25), appealed as the only qualified electrician left in the town, and he was exempted until January 1st.

Cleobury Mortimer Tribunal has refused exemption to A. F. Lightfoot, electrician at Highley Picture Theatre, and notice of appeal was given on the ground that appellant is unfit for foreign service.

At Chester-le-Street, on October 30th, the County of Durham Electric Power Distribution Co. appealed for a meter fixer and tester and account collector (37). He was put back until called up, with the right of appealing again.

Before the Holland (Lincs.) Appeal Court, on October 27th, Mr. R. W. Sanders, of Boston, appealed for the retention of C. E. Clare (30), electrical case maker, but the appeal was rejected.

Castleford Tribunal has refused exemption to F. P. Smith (18), electrician to the Victoria Picture Co., the only man left to attend to the electrical apparatus at three picture halls.

The East Kent Appeal Court, on October 30th, granted six months' exemption to Mr. Colin Campbell (40), managing director and secretary of the Whitstable Electric Light Co. Mr. Campbell had previously been given until January 15th, and against this the Military Representative unsuccessfully appealed. It was stated that Mr. Campbell had been trying to get capital for debentures to prevent the winding up of the company, and that in ten months he had been successful in raising and getting promises for about £4,500 for this purpose.

At Folkestone, on October 21st, Mr. A. R. P. Thorn (23), electrician, was granted one month's exemption.

At Bexhill-on-Sea, Messrs. Bruce & Co., electrical engineers, appealed for W. R. Chapman (29), but the Military opposed, on the ground that a discharged man from the Royal Engineers should be employed. Mr. Bruce stated that he had tried without success to replace Chapman, who had been with them for 15 years. He added that he could do with six electricians. Three months were allowed.

Battle Rural Tribunal have granted conditional exemption to Mr. C. D. Geer (31), electrical engineer.

Shoreham (Sussex) Tribunal, on Monday, granted two months' exemption to an electrical engineer, aged 40, passed in Class B 1, and who has four brothers serving.

A Brighton firm of electricians appealed, on Monday, for an electrician (26) and a wireman (33), and stated that they had lost 63 men. The electrician was allowed a final 14 days, and the wireman two months.

At Douglas (Isle of Man), on October 31st, Mr. Edmondson, of the Manx Electric Railway Co., appealed for B. A. Robinson (18) and W. A. Cowan (18), electrical engineering pupils, both of whom are in the third year of their training. Each was exempted until they attain the age of 19.

At Douglas (Isle of Man), on October 31st, Mr. W. J. Fargher appealed for the retention of W. S. White (35), electrician, the only man left to do the electrical repairs, and who was essential to the business. Conditional exemption was granted.

## BUSINESS NOTES.

**Catalogues and Lists.**—Stonebridge Electrical Co., Ltd., Windmill Road, Hampton Hill, Middlesex.—16-page price list of drawn-wire metal filament lamps.

Spray Engineering Co., Boston, U.S.A.—Bulletin describing their "Spraco" paint gun.

**The Foreign Trade Representative.**—In the articles which we have published from time to time by expert observers in different markets abroad regarding the spirit and measures that will be most likely to operate in favour of British trade, the writers have attached great importance to the social standing, habits and presence of the representatives who are sent out by our manufacturers. Our contributors in Egypt, India and China in particular have laid emphasis upon the matter. An American Consul has just put such points very plainly before U.S. traders in connection with efforts in the West Indies. He says that it will depend largely upon the representatives they send to win this market how far American firms are successful there. In the past poor impressions sometimes made by salesmen have been unsatisfactory and anything but factors in the promotion of trade. In more than one case prejudice has remained for a long time, and it has been hard work to remove it and restore confidence. "The day of the noisy, self-advertising commercial traveller has long gone by, at least in these countries, and the cultured, courteous representative is the type wanted. The merchants of these Colonies are men who have built up their firms through years of thrift and close attention to business, and who hold the respect of the communities in which they live. As in most tropical countries, their people have a leisurely way of doing business. They like to 'take it easy,' to talk things over. Often the ability to add social courtesy to business efficiency is the surest method of getting business, and the commercial traveller who may be introduced to their social clubs or to their homes is not unusually the man who will book the most orders. A representative of one large American house closed in a half hour, 'over the teacups,' a contract on which he had been working unsuccessfully for days at the business office. Many an order obtained on the cool veranda of a tropical clubhouse after lunch would not have been given elsewhere."

**Private Arrangement.**—The Tyler Apparatus Co., Ltd., Bannister Road, Kilburn Lane, N.W., electrical engineers, &c.—A conference of creditors was held last Friday, at the Institute of Chartered Accountants, Moorgate Street, E.C., for the purpose of considering a proposal by the company for the ultimate payment in full of the unsecured creditors. The chair was occupied by Mr. P. Houstoun, of Messrs. Corfield and Cripwell, accountants and auditors, who said that the conference was the outcome of negotiations which had taken place. The company was formed in 1912, with a nominal capital of £10,000, and received £3,500 for shares, which were subscribed for in cash. Shares of the face value of £5,000 had been allotted to the vendors. An approximate balance sheet had been prepared as at October 13th last, the date when a receiver was appointed. That showed that the total liabilities of the company were £22,814, made up as follows:—Issued capital, £8,505; debentures, £2,950; cash and trade creditors and bills payable, £9,488; and further cash claims, £1,871. On the other side of the balance sheet it appeared that up to January 1st of the present year there was a loss on the trading of £5,865, while since that date there had been a loss of £386. The assets were as follows:—Cash, £34; furniture, £200; premises account, £400; constructional works, £469; pattern account, £122; tool account, £532; plant and machinery, £2,656; goodwill, £5,000; stock, £1,553; and sundry debtors and bills receivable, £5,571. Some time ago, a creditor in the North of England levied execution, and in order to protect the assets, a receiver was appointed. The execution creditor had since filed a petition for the compulsory winding-up of the company. In September, 1913, a debenture for £6,000 was issued to the parent company to secure a cash advance. There were five other affiliated companies who had money advanced to them by the parent company. At the same time, the parent company issued a debenture for £25,000 to the bank, and all the subsidiary companies executed a declaration and admission of trust in favour of the bank. They also gave an undertaking to the effect that they would not, without the permission of the bank, pay off any of the debentures which had been issued in favour of the parent company. The manager of the present company knew nothing about that declaration, and it appeared that over £4,000 of the original debenture had been paid to the parent company. A receiver had been appointed in connection with the parent company, and that gentleman had a claim against the present company, not for the balance of the debenture of £1,400, but for the original amount of £6,000. Of course, the present company had a claim against the parent company for the £4,000 odd which had been paid off the debenture, but that might be a bad debt. Second debentures in the company were held by a Mr. Powell, who only advanced his money during the present year. The manager of the company (Mr, Pearson) had also advanced considerable sums, and guaranteed the accounts of some of the creditors. When the bank advanced money to the parent company, the amount was guaranteed. The guarantors proposed to settle with the bank, and to transfer the balance of the first debenture of £1,400 to the second debenture-holder. The latter would then advance the company a further sum of £1,000 to provide it with the necessary working capital. The amount which the company had repaid off the debentures would be wiped out. Certain of the book debts were charged, but the debenture-holder was agreeable to the remaining book debts being released and collected for the benefit of the unsecured creditors. From the book debts it should be possible to collect sufficient to pay the creditors at least 2s. or 3s. in the £ on the amount of their claims. After the book debts had been collected, the company would pay over £50 weekly for the liquidation of the creditors' claims. The smaller creditors would be paid in full within a reasonable time. It had to be remembered that unless some scheme was adopted, the unsecured creditors would get nothing. Under the present scheme the creditors would certainly receive 2s. or 3s. in the £, and they stood a sporting chance of receiving a good deal more.

In answer to questions, Mr. Houstoun stated that the company had always been hampered for want of capital. In 12 months a considerable sum was paid for accommodation. If the company was wound up, the creditors would not get anything. There was a considerable number of suing creditors.

Several creditors expressed the opinion that there was a good future before the company, and that every effort should be made to continue it. The matter was discussed at some length, and eventually resolutions were passed in favour of the acceptance of the scheme, and it was decided that the petition for the winding-up of the company should be opposed. Mr. G. E. Corfield was appointed to act as trustee for the creditors in the matter, and it was stated that the Court would be asked to approve of the scheme, and a further meeting of the creditors would then be called.

**Car-lighting Devices in Australia.**—Although several tenders were sent in in response to the Melbourne Tramways Board's invitation for devices for car illumination, none proved entirely satisfactory, the fault in most cases being the expense of working, but in some the delay entailed in procuring the plant. Fresh tenders are, therefore, being invited, and it is stipulated that tenderers who cannot supply plant must state the cost of the plant that will be required. The Board now has 1,014 cars, but the plant must be capable of meeting the requirements of 1,250 cars with lights of approximately 100 c.p. to each car. Tenderers must also state the cost of maintenance, and whether they are prepared to install the plant and give a fortnight's trial of their system on one of the cars. The Board offers in various ways to assist tenderers in the experimental stage of their work, and will also give a premium of £100 for the most suitable design, with specifications, whether it is adopted or not.—*Australian Mining Standard.*

**Book Notices.**—"Walford's Tea, Coffee and Rubber Guide." London: Martin Walford & Co. 1s. 6d. net. This pamphlet gives a list of about 300 dividend-paying rubber shares and their yields.

"*Journal* of the Röntgen Society." No. 49, Vol. XII. October, 1916. London: Percy Lund, Humphries & Co. Price 4s. net.

"Science Abstracts." A and B, Vol. XIX, Part 10. October 25th, 1916. London: E. & F. N. Spon, Ltd. Price 1s. 6d. each.

"Elenco dei Fabbricanti in Italia di Materiale e Macchinario Elettrico. Milano: Stabilimento Grafico Stucchi, Ceretti e C.

"Scientific Papers of the Bureau of Standards." No. 289. "The Damping of Waves and Other Disturbances in Mercury." No. 291. "A System of Control for an Electric Testing Laboratory." Washington: Department of Commerce.

"*Proceedings* of the American Institute of Electrical Engineers." Vol. XXXV, No. 10. October, 1916. New York: The Institute.

"Engineering Industry in War and Peace." The B.E.A.M.A. has published a pamphlet containing verbatim reports of the speeches delivered at the Mansion House meeting in September, together with photographs of the speakers.

"Business—and Bribery after the War." By R. M. Leonard. Twelve-page pamphlet issued by the Bribery and Secret Commissions Prevention League Inc., 9, Queen Street Place, E.C.

**British Travelling Exhibitions.**—Replying to a Parliamentary question, the other day, Mr. Runciman said that he was considering the possibility of arranging for an exhibition of British manufactures which would visit the principal commercial centres in the Dominions. He was in communication with the Secretary for the Colonies on the subject. Extensive preparations would have to be made should an exhibition of the kind prove practicable. He did not contemplate attempting to include in the present scheme exhibitions in neutral countries.

**Liquidation.**—General Accessories Co., Ltd.—A meeting of creditors is called for November 7th, at 120, Blackfriars Road, S.E.

**Bankruptcy Proceedings.**—R. E. Connold, electrician, Canterbury.—November 17th is the last day for the receipt of proofs for dividend. Mr. G. E. Corfield, trustee, Balfour House, E.C.

## LIGHTING AND POWER NOTES.

**Aberdeen.**—The Electricity Committee is supporting the recommendation of the electrical engineer that tenders be obtained for the erection of a sub-station at the east end of York Place, at a cost of £2,800; the continued additions of load in this area, together with a recent application of a further 700 h.p. for a shipbuilding yard, make it imperative to proceed with the work at once.

**Accrington.**—Linking-up.—At a recent T.C. meeting, Alderman Higham favoured the proposed interconnection of the Lancashire electricity supply systems. The interlinking of Accrington with Rawtenstall, and probably Blackburn, would be beneficial, especially during temporary breakdowns.

**Aldershot.**—Price Revision.—The D.C. has decided to increase the charges for electricity as follows:—A flat rate of 6d. per unit, in lieu of 4½d. per unit, plus 10 per cent.; power and heating, 3d. to 2½d., instead of 2d. to 1½d. plus 20 per cent.; Messrs. Gale and Polden to be charged for power consumption 1½d. per unit, in lieu of 1d. per unit, plus 20 per cent.; and a rental to be made for consumers' meters of 1s. 6d. to 2s. 6d. per quarter, according to size.

**Ardsley.**—Sewage Works Supply.—The Electrical Distribution of Yorkshire, Ltd., has been asked to guarantee a supply of electrical energy at Brodilley Sewage Works for a period of five years, with the option of a further five years' extension.

**Australia.**—The Huntley Shire Council (Victoria) has been requested by the ratepayers to consider the erection of a municipal plant to supply Elmore with electric light and power, or alternately, that the Council should forego its right in favour of a company. A report on the project has been prepared and forwarded to the Council for its information.

The Renmark (South Australia) electric lighting plant has been taken over by the Council. The consulting engineer, Mr. F. Coote, has recommended an increase in the power plant by 100 h.p.

In connection with the Inkerman (Queensland) irrigation scheme, Messrs. J. Hargreaves (hydraulic engineer) and H. Eklund (assistant engineer), Queensland water supply department, have recently returned from a visit to the Lower Burdekin district. The scheme embraces an area of 25,000 acres. It is estimated that 6,000 acres would be ready for planting cane when the scheme is available to supply water, and with the system of rotation 2,000 acres will be dealt with at a time. Distribution will be controlled by electricity. Though pumping is the most important feature, it is expected that before long the pumping demand will be secondary to that for general use. A steam generating set is proposed for the work, with a distribution at 6,600 volts to the pumps.—*Tenders.*

**Bacup.**—Bulk Supply.—The T.C. has intimated to the Rawtenstall Corporation its inability to agree to terms for supply, unless informed of the terms granted by Rawtenstall in the case of the Haslingden supply.

**Baildon.**—E.L. Proposal.—With regard to the question of electricity supply, the Council has informed the Shipley D.C. that it does not at present favour the suggestion of granting general powers to distribute electricity in the Baildon area, and that the matter may be considered in abeyance until the conclusion of the war.

**Barnsley.**—Year's Working.—There was a deficit of £363 on the working of the Corporation electricity undertaking during the past year.

**Belfast.**—A deputation representing the electrical trades of the city recently waited on the City Council to urge the necessity of proceeding with the erection of the new electricity station at the Musgrave Channel, and installing the first set of not less than 5,000 kw. as quickly as possible. It was urged that the present station had now reached its maximum output, and that the members of the electrical trades felt that their business was likely to suffer unless suitable provision for electric supply was made. The Lord Mayor assured the deputation that the subject would be taken up afresh and discussed seriously, but he could not promise anything more than that.

At a recent meeting of the Council, Mr. Caughey pointed out that the city electrical engineer reported that he estimated the demands upon the station would leave a margin of about 11 per cent. on the plant, based upon the assumption that the whole of the plant was simultaneously available at its full normal rating.

**Birmingham.**—Several times during the last week the Corporation tramway service was suspended owing to shortage in power supply. The Electricity Committee, at a meeting on Friday last, specially considered the matter; the question was whether it was wise to notify the public that between certain hours the cars would be definitely stopped, pending the repair and extension of the plant at the Nechells power station, or whether it would be better and more advantageous that efforts should be made to run the cars as often as possible. Mr. Chattock, the chief electrical engineer, and Mr. Baker, the tramways manager, had discussed the matter, and the conclusion arrived at was that it would be better not to issue any definite notice as suggested.

Another matter which occupied the attention of the Committee was the general question of the supply of current throughout the city. The output of the department has increased from 80 million units to 150 millions during the last two years, and efforts have been made to increase the engine power in a corresponding degree. Deliveries of plant, however, have been frequently delayed, and this, with a depleted staff, is largely the cause of the inability of the department to cope with the demands made upon it. Steps are being taken to secure the installation of plant, which should have been in working order by the end of September, before the middle of December, and when that has been accomplished it is hoped the output will be materially increased and that the difficulties of the Committee will come to an end.

**Canadian Water Power.**—The High Commissioner for Canada has received the following information by cable from the Hon. W. J. Roche, M.P., Minister of the Interior at Ottawa:—Apart altogether from the Northern Territories, practically all the Yukon Territory and the northern and eastern portions of Quebec, where the resources are not yet exploited, some 17,746,193 h.p. are available in water powers in the Dominion of Canada. Developed water powers aggregate 1,712,193 h.p., of which Nova Scotia has 21,412 h.p.; New Brunswick, 13,390 h.p.; Prince Edward Island, 500 h.p.; Quebec, 520,000 h.p.; Ontario, 789,466 h.p.; Manitoba, 56,730 h.p.; Saskatchewan, 45 h.p.; Alberta, 33,305 h.p.; British Columbia, 265,345 h.p.; and the Yukon Territory, 12,000 h.p. Eight million h.p. are available within range of the present markets, and within 15 years will be in use.

**Clyde Valley.**—New Power Station.—On November 1st the new Cambuslang power station of the Clyde Valley Electrical Power Co. was formally opened. The plant is situated at Clyde Mill, the river water being available for condensing purposes. The first generating set installed is a Westinghouse 5,000-kw., 25-cycle, three-phase turbo-alternator, supplied with steam from Babcock & Wilcox boilers, each evaporating 34,000 lb. of water per hour at 200 lb. per sq. in. For coal supply the wagons are tipped hydraulically into a hopper, which supplies the conveyors passing over the bunkers; the ash and soot are removed by a suction plant. The buildings are steel framed with brick filling, and a portion of the old mill dam has been rebuilt in concrete. It is interesting to note that woman labour has been employed with success on the works.

**Continental.**—Germany.—According to the "Muenchner Neweste Nachrichten," the electricity supply works on the Isar have been enlarged in order to supply the new Krupp works with electric light and power. In consequence of the impossibility of providing the required hydraulic machinery, recourse has been had to steam power, and a steam turbine of between 5,000 and 6,000 h.p. has been installed.

Norway.—The Hitterdal Divisional Council has decided to acquire the Omles waterfall in Sauland, with a view to the erection of a hydro-electric station at a cost of either 455,000 kroner or 590,000 kroner, according as it is decided to develop 1,400 h.p. or 2,800 h.p.

The Stadsraad on October 14th approved of a resolution of the authorities of Rygge to raise a loan of 100,000 kroner for extensions of the Communal electric station.

With a view to power production, the Trondhjem Municipality has decided to build a dam across an inlet of the sea opposite Neadal, enclosing an area of 20 kilometres, and creating a 15-ft. fall.

**Darlington.**—The report of the electricity department shows an increase of 22 per cent. in the number of units generated for lighting and power purposes since April last. The accounts to the end of March last showed a net profit of £2,918, and the Committee recommends that this be placed to the reserve account.

**Folkestone.**—Price Increase.—The Electricity Supply Co., Ltd., has notified the T.C. that from the meter readings at the beginning of the December quarter, the charge for current will be increased by a further 5 per cent., in addition to the 10 per cent. already enforced.

**Harrogate.**—Year's Working.—The annual accounts for 1915-16 show a total revenue of £20,202; working expenditure amounted to £9,437, and the gross profit to £10,765. From the latter, after meeting interest and sinking fund charges, £1,784 was placed to reserve and £1,000 to relief of rates; the balance, together with £289 from reserve, making £819, was expended on works of a capital nature. The reserve balance amounts to £4,029. During the year 1,474,234 units were sold, the maximum load amounting to 800 kw.

**London.**—Hackney.—The Electricity Committee recommends the extension of the distributing main in High Street, Kingsland, in order to supply electricity to a factory, the firm guaranteeing a minimum of £100 per annum for five years. The Committee also recommends that application be made to join the I.M.E.A.

Woolwich.—At the meeting of the B.C. the Electricity Committee reported having completed negotiations for supply with one large company. Negotiations are proceeding with an important authority whose representatives had applied for terms for a stand-by supply. The terms accepted in the one case, and the terms offered in the other, are such as will safeguard the Council against any large capital expenditure or loss on revenue account. The Works Committee reported having entered into an arrangement in regard to the lighting of certain roads

Islington.—Extra Wages.—The B.C. has granted an addition of 1d. an hour to the wages of the employés of the electricity department.

**Lowestoft.**—Last week Mr. R. C. Maxwell, inspector of the L.G.B., held an inquiry into the application of the T.C. for sanction to various overdrafts, including £4,000 on the tramways account and £6,000 on the electric lighting account.

**Newport (Mon.).**—The Electricity Committee has considered the memorandum circulated by the Joint Committee in connection with National Electricity Supply, and has passed a resolution authorising the borough electrical engineer, Mr. A. Nichols Moore, to take part in the proposed Committee for that area of supply, and to report as to progress made with the scheme, without, however, pledging the Committee to any course of action until it has had full opportunity of considering it.

**New Zealand.**—According to the *New Zealand Gazette*, as a result of a poll of the ratepayers of the Borough of Stratford (North Island), it has been decided to borrow the sum of £16,000 for street lighting, electric power supply, &c., purposes.

**Oulton Broad.**—Street Lighting.—The local electric lighting company has informed the U.D.C. that it does not see its way to make any further reduction in the contract prices for street lighting. The matter has been referred to the General Purposes Committee.

**Reigate.**—At the meeting of the T.C. it was stated that, for the half-year ending September 30th, which included the five months covered by the Daylight Saving Act, the undertaking had lost in revenue from lighting £594. The reduced demand had enabled the staff, for the first time in the history of the undertaking, to shut down the whole of their steam plant, and run entirely on oil, thus saving 93 tons of coal. If they could continue to run through the winter without the aid of steam, as there was reason to hope they might, the loss of revenue would, in a measure, be compensated for by the saving in consumption of coal.

**Ripon.**—E.L. Scheme.—The T.C. has decided to apply for a provisional order for electric supply; the approximate cost of the scheme is £20,000. The site selected by a Committee for the generating station did not meet with the approval of the Council, and in order to give the Committee the opportunity to select another site the matter was adjourned.

**Rotherham.**—Plans have been passed for the Rotherham Forge and Rolling Mills Co., Ltd., for an electrical sub-station; the Corporation electricity department is to carry an overhead electric cable across the River Don to these works. New electrical air compressors are to be put in at the sewerage works, and towards the cost the Electric Light Committee will contribute £500.

**Sheffield.**—Proposed New Power Station.—The Electricity Committee reports that the generating station at Neepsend is unequal to supplying all the power required by consumers, and recommends that a new generating station be provided. The Committee recommends that Sir Alex. Kennedy be asked to advise on the matter, and that steps be taken for obtaining the necessary powers, either by the promotion of a Bill in Parliament or otherwise, to carry out any scheme that may be decided on.

The Finance Committee approves of the recommendation of the Electricity Committee to acquire land and erect a sub-station at a cost of £8,000 exclusive of the cost of the land, subject to Government approval.

**Swinton (Yorkshire).**—Street Lighting.—A question has arisen between the Swinton U.D.C. and the Mexborough and Swinton Tramway Co. in regard to the matter of payment by the Council to the company for current for public lighting, which, under the restrictions of the present time, has been discontinued. The company has insisted upon full payment of the rate per lamp which it is entitled to under its Act, and has held up the payment of rent to the Council as security for settlement of the lighting account.

**Wolverhampton.**—Price Increase.—The charges for electricity are to be increased temporarily by 10 per cent., in order to put the electrical undertaking on a sound financial basis.

The Electricity Committee, in its annual report, states that, notwithstanding the increased prices of material and labour, the costs of production per unit sold show a decrease, compared with the year previously, under every heading excepting that of coal. During the year it was found necessary to make preparations for additions to the generating plant, and the L.G.B. sanctioned loans amounting to £51,416 for this purpose. These extensions cover the addition of two boilers with all auxiliaries, one 5,000-kw. turbo-alternator set with the necessary switchgear, &c., alterations to the buildings of the boiler and engine houses, new converter plant, and sub-stations in the town, together with E.H.T. mains. The steady increase of output from the works has been maintained, as will be seen from the fact that for the year under review the increase in units sold was 2,154,426. Negotiations have taken place with several important outside industrial undertakings who have under consideration the question of building new works, with a view to their taking electricity supply in Wolverhampton, and it is hoped good results will follow.

## TRAMWAY and RAILWAY NOTES.

**Bacup.**—Arbitration.—Mr. McElroy has appointed November 20th for the arbitration between the Bacup and Rawtenstall Councils on the question of alteration of the tramway fares between the two towns, if necessary; the arbitration will be continued on November 22nd.

**Blackpool.**—Year's Working.—In his annual report, Mr. Chas. Furness states that the total income of the Corporation tramways was £80,066 and the working expenses were £45,030. The gross profit of £35,025 was divided as follows:—Interest and sinking fund charges, £18,760; reserve fund, £3,275; permanent way renewal fund, £8,000; and contributed to rates, £5,000. The net profit constituted the third best in the history of the department. The year's receipts were £3,961 more than in the previous year, though up to the end of September the increase only stood at £849. The winter months showed an approximate increase of £2,600. The number of passengers showed an increase on the year of 961,337, and the mileage a decrease of 16,132. The passengers carried numbered 14,585,851.

Seventy employés are on war service, three have fallen in action, whilst a number of others have sustained injuries. Referring to the employment of female conductors, Mr. Furness says they have, on the whole, acquitted themselves creditably.

**Blackpool—Lytham.**—Storm Damage.—Owing to a sudden gale on the Fylde Coast, on October 30th, the tramway service on the Blackpool, St. Annes and Lytham route was impeded, owing to the wires being blown down. The cars were held up for some time during the evening; those on the Promenade route found it impossible to run to time.

**Bradford.**—Our correspondent writes that the queue system has been in operation for a long time on certain of the tramway routes, but in Forster Square, the centre of a wide distribution of services, there has been difficulty in establishing a satisfactory queue method, owing to the fact that the Heaton, Frizinghall, Baildon Bridge, Saltaire, Bingley and Cross Flatts cars run over the same route for considerable distances out of the city. Their starting point, too, is at a most congested corner. Recently an attempt was made to establish some sort of order in the unruly mob which has been in the habit of rushing the cars, by posting notices threatening penalties if a queue were not formed, but these had little or no effect, and last week three separate queues, with barriers, were fixed. The result is not altogether a success, because inspectors and policemen have still to keep order, and the congestion at the two corners now in use is probably worse than ever.

**Continental.**—Spain.—The *Gaceta de Madrid* publishes a notice authorising the Compania Nacional de Tranvias de Barcelona to undertake the extension of the electric tramway to Sans.—*Board of Trade Journal.*

**Darlington.**—Traffic Results.—The tramway revenue for the past six months shows an increase of £432. The Committee recommends that the salary of the traffic superintendent be raised to £170 per annum, but a request by male employés for an increased war bonus has been referred to the General Purposes Committee.

**Halifax.**—The Corporation has applied to the B. of T. for a further Order under the provisions of the Special Acts (Extension of Time) Act, 1915, to extend until August 18th, 1918, the period for the completion of the following tramways authorised by the Halifax Corporation Act, 1911, viz.:—Nos. 1, 2, 4, 7, 14, 15, 16, 17, 18, 21, 22, 34, 36, 37, 38 and 39, wholly situate in the borough; Nos. 19 and 20, wholly situate in the urban district of Queensbury; Nos. 23 and 24, wholly situate in the urban district of Shelf; and Nos. 25, 26 and 27, wholly situate in the borough of Brighouse.

**Huddersfield.**—The queue system of loading tramway cars was put into operation for the first time in Huddersfield last week. Though, owing to the narrowness of the causeways, no barriers have been erected, the system is said to work satisfactorily.

**Rochdale.**—Tramway Accident.—An accident occurred on Thursday, last week, to a Corporation car travelling between Whitworth and Bacup, 12 passengers being injured. The car got out of control on a gradient and jumped the points; it was put back on the line and ran backwards, and again jumped the metals, finally colliding with an electric standard, and overturning in such a position that it hung balanced on a low wall overlooking a valley.

**Rotherham.**—New Cars.—Owing to the rapidly-increasing traffic on the tramways, tenders are to be invited for the supply of six new double-decked cars. Mr. Edward Cross, the tramway manager, reported that it would take from six to eight months to obtain delivery.

**Sheffield.**—The number of passengers carried on the Corporation tramways during October was 11,493,379, as compared with 9,771,602 for the corresponding period of 1915; the receipts were £43,341, as compared with £36,755.

The Tramways Committee recommends the purchase of land at Pickmere and Fitzgerald Roads, at a cost of £1,065, for a depôt.

**U.S.A.**—On Wednesday a Boston car left the track and fell over the bridge at Fort Point Channel, 54 passengers being drowned.

**Winchester.**—Electric Vehicle.—The Electricity Committee has had under consideration the desirability of purchasing a small electrically-driven van, which, while serving as a demonstration car, could also be used with advantage by the department in the delivery of stores; before, however, coming to a decision the Committee is causing further inquiries to be made as to whether such a vehicle could do all the work required as cheaply as by the present method. The Mayor stated that up to the present about a dozen vehicles (ten tractors and two private) had been recharged at the works.

**Wolverhampton.**—Year's Working.—The report of the year's working of the Corporation tramways to March 31st last, shows a gross profit of £24,893, which, with £1,459 added on motor-omnibus account, makes a total of £26,353; after meeting charges for interest and sinking fund, there remained a net profit of £13,271. The reserve and renewal account now stands at £56,598. The Tramways Committee give the following statement of traffic receipts for the first six months of the financial year commencing April 1st, 1916:—Car-mileage, 590,685; passengers carried, 7,516,858; receipts, £33,259, being 13·5d. per car-mile. The figures for the same period of last year were:—Car-mileage, 585,614; passengers carried, 6,617,064; receipts, £29,525, or 12·11d. per car-mile.

## TELEGRAPH and TELEPHONE NOTES.

**Long Submarine Telephone Cables.**—A 12-conductor telephone cable was recently laid across Vineyard Sound to connect Martha's Vineyard Island with the mainland of Massachusetts, and a six-conductor cable was laid, at the same time to connect the island with Nantucket Island, a distance of nearly 20 miles. The latter island was previously without telephone connection.

The large size of the Vineyard Sound cable—2·69 in., and weighing 10·6 lb. per running foot—was necessitated by the strong tides prevalent in that body of water. It is one of the heaviest ever handled by a power, telephone, or telegraph company. The Nantucket cable is about 5 lb. to the foot. In the former cable each conductor is wrapped in double paper insulation, with a similar wrapping on the core, around which is a lead sheath $\frac{5}{32}$ in. in thickness. Around this are three layers of 100-lb. jute roving, bound by 23 armour wires 0·203 in. in diameter, also enclosed in two layers of jute roving, and finally bound in an outer armour of No. 4 steel wires, the final wrapping being two thicknesses of No. 16 three-ply jute yarns.

The Nantucket cable has double insulation, a lead and tin sheath $\frac{5}{32}$ in. thick, and three layers of 100-lb. jute roving bound in steel wire armour of 18 strands, 0·238 in. in diameter.

The Vineyard Sound cable reached the point of departure from the mainland in four reels, weighing respectively 71,400, 71,500, 72,300, and 36,800 lb., these being among the heaviest reels on record.

The laying of the cables was done by the Western Union Telegraph Co.'s cable ship *Clowry*.

The Nantucket cable is the longest electrical conductor under water in the United States. Its total weight is 361 tons.—*Electrical Review and W. Electrician.*

**Telegrams by Telephone.**—In view of the difficulty in making prompt delivery of telegrams by messengers on account of the growing dearth of boy labour, the Post Office authorities point out that the delivery of telegrams by telephone, with delivery by post of confirmatory copies, provides a good alternative. It would be of great assistance to the Post Office if the public would make greater use of the arrangement under which telegrams may be directed to a telephonic address, as, for example :—"Smith, Midland 245, Birmingham." Subscribers are recommended to print their telephonic addresses on their notepaper, and to advise their regular correspondents to address their telegrams accordingly.

## CONTRACTS OPEN and CLOSED.

### OPEN.

**Argentina.**—November 30th. Buenos Aires Municipality. Electric carbons required during 1917. Oficina de Licitaciones, Intendencia Municipal de la Capital, Avenida de Mayo, 525, Buenos Aires.

**Australia.**—SYDNEY.—January 22nd, 1917. Electrical plant (converter, battery, booster, and switchboards) for the Castlereagh Street sub-station, for the Municipal Council. Specification from E.L. Department, Town Hall.*

January 8th. Municipal Council Electric Lighting Department. 33,000-volt switchgear. E.L. Department, Town Hall. Specification 10s. 6d.*

MELBOURNE.—December 11th. City Council. Supply and erection of coal transporter plant. See "Official Notices" September 15th.

NEW SOUTH WALES.—Time for sending in tenders for 50-ton electric overhead travelling crane for Yarra Street power-house, Newcastle, extended to January 3rd.*

**Bradford.**—November 11th. Stores for the Tramways Department. Tramway Offices, 7, Hall Ings. Deposit £1 1s.

**Cape Town.**—January 5th. Electric motors and starting panels, for the Corporation Electricity Department. Dock Road, Cape Town.*

**Chatham.**—November 15th. T.C. Annual contract for electric lamps, stores, &c. Borough Surveyor, Town Hall.

**Durban.**—January 3rd. Corporation. One 3,000-KW. steam turbine, alternator, and condensing plant. Specification No. S. 238; drawing No. P. 597, both at the office of the Borough Electrical Engineer, Municipal Buildings. Deposit £2 2s.

**Enniskillen.**—December 1st. Sligo, Leitrim & Northern Counties Railway Co. Twelve months' supply of telegraph materials. Mr. J. Duff, Secretary to the Company.

**Grenada.**—December 31st. Government. Electric supply at St. George's and suburbs. Tenders to Colonial Secretary, Grenada, British West Indies.

**Johannesburg.**—November 20th. Corporation. 500 or 1,000 trolley wheels for tramcars (Contract No. 181).*

November 27th. Corporation. 1,000 sets of single-pole, ironclad house-service cut-outs (Contract No. 187).*

November 27th. Corporation. 250 field coils for tramcar motors (Contract No. 192).*

December 20th. Corporation. Automatic pressure regulators for the A.C. turbo-generators at the power station.*

December 9th. Corporation. 1,427 A.C. and D.C. electricity meters and 100 time-switches. Specification (21s. deposit) from Mr. E. T. Price, General Manager's Office, Electricity Supply and Tramways Department, President Street, Johannesburg, W.*

January 3rd. Corporation. Iron axles and bushes.*

**Liverpool.**—November 22nd. Cheshire Lines Committee. General stores, including (6) telegraph materials and carbons, during 1917. Stores Superintendent, Warrington.

**Middleton.**—November 11th. Corporation. 4,000 tons washed or dry slack steam coal for the Electricity Department. Particulars from the Borough Electrical Engineer.

**New Zealand.**—DUNEDIN.—January 24th, 1917. Motor-generator, accessories and spares. City Electrical Engineer, Market Street Dunedin.*

**Oldham.**—November 13th. Electricity Committee. Steam coal for 8 or 12 months during 1917. Mr. F. L. Ogden, Greenhill Electricity Works.

**Rhondda Valley.**—November 20th. Electrical installation in screwed tubing for Messrs. David John & Co., brewers, Pentre. See "Official Notices" to-day.

**Rotherham.**—November 16th. Tramways Committee. Six electric double-deck, top-covered cars. See "Official Notices" November 3rd.

**Salford.**—November 13th. Covering steam piping, valves, &c. Borough Electrical Engineer, Frederick Road.

**Stalybridge.**—Tramways and Electricity Board. Water-tube boilers, mechanical stokers, and cooling towers. See "Official Notices" November 3rd.

**Stretford.**—November 21st. Corporation Electricity Works. Twelve months' supply of best Lancashire rough slack coal—12,000 tons. Tenders to Council Offices, Old Trafford.

**Wakefield.**—November 20th. Supply of coal for the electricity works, Calder Vale, for a year. City Electrical Engineer, Old Town Hall.

**Wigan.**—November 15th. Twelve months' supply of firing slack for the electricity works. Mr. W. H. Tyrer, Town Clerk, Municipal Offices, King Street West.

**York.**—November 23rd. North-Eastern Railway Co. Six and twelve months' supply of telegraph apparatus, telegraph wire and line stores. See "Official Notices" to-day.

Specifications for the items marked * can be seen at the Board of Trade Commercial Intelligence Department in London.

### CLOSED.

**Australia.**—Victorian Railways Department :—

D.C. motors for pumps for State coal mine.—Aust. General Electric Co.

N.S.W. Public Works Department :—

5,000-volt switchboard, Homebush abattoirs, £1,453.—A. T. Carter & Co.
Sub-station equipment for ditto, £970.—N. Guthridge, Ltd.
5-ton loco. electric cranes, £4,260.—Strachan, Murray & Shannon.

The Tenterfield (N.S.W.)-Council has accepted the tender of the Commonwealth Electrical Construction & Supply Co. for the installation of electric lighting in the town. —*Tenders.*

**Manchester.**—Electricity Committee :—

Cable.—B.I. & Helsby Cables, Ltd.; Western Electric Co.; Callender's Cable & Construction Co., Ltd.
Turbine feed pump.—G. & J. Weir, Ltd.
Sub-station switchgear.—Ferranti, Ltd.

Tramways Committee :—

Copper trolley wire.—F. Smith & Co., Ltd.

**Rotherham.**—District Council. Accepted tender :—

Chadwick & Co. (Rotherham).—Extension of the boiler-house buildings at generating station, for the additional two water-tube boilers.

**Salford.**—Lighting and Cleansing Committee :—

Lancashire Dynamo & Motor Co.—One No. 5 D.C. motor and accessories, £65.

**Sheffield.**—According to a Sheffield paper, the Electricity Supply Committee is authorising the general manager to obtain tenders for the purchase of certain obsolete plant at the Sheaf Street and Neepsend generating stations, and to accept the quotation of Messrs. C. A. Parsons & Co., Ltd., amounting to £19,000, plus an allowance of 5 per cent. for contingencies, for two turbo-alternators, switchgear, and alterations to pipework in replacement of the plant referred to, to be erected at Neepsend for working with the existing condensers.

**Woolwich.**—Borough Council. Accepted tender :—

G. & J. Weir.—Feed pump (capacity 10,000 to 12,000 gallons), £325.

## FORTHCOMING EVENTS.

**Royal Society of Arts.**—Friday, November 10th. At 5.15 p.m. At John Street, Adelphi. Chadwick Lectures on "Fatigue and its Effect on Industry and Efficiency," by Professor Stirling.

Wednesday, November 15th. At 4.30 p.m. Opening address, "The Stability of Great Britain," by Dr. Dugald Clerk, F.R.S.

**Physical Society of London.**—Friday, November 10th. At 5 p.m. At the Imperial College of Science, South Kensington, S.W. Ordinary meeting.

**Chief Technical Assistants' Association.**—Saturday, November 11th. At 3 p.m. At the Tavistock Hotel, Covent Garden. Discussion on "Coal and Ash-Handling Plant," to be opened by Mr. J. T. Baron.

**Association of Mining and Electrical Engineers (West of Scotland Branch).**—Saturday, November 11th. At 4.30 p.m. At the Royal Technical College, Glasgow. Lecture on "Friction Surfaces," by Mr. J. Oswald; demonstration of oxy-acetylene, by Mr. W. L. Brown.

**City of Nottingham Industrial Development Committee.**—Monday, November 13th. At 6.30 p.m. At the Exchange, Nottingham. Address on "War and Industrial Revival," by Mr. T. C. Elder.

**Institution of Electrical Engineers (Birmingham Local Section).**—Wednesday, November 15th. At 7 p.m. At the University, Edmund Street. Kelvin Lecture, "Some Aspects of Lord Kelvin's Life and Work," by Dr. A. Russell.

**(Manchester Local Section).**—Tuesday, November 14th. At 7.30 p.m. At the Engineers' Club, Albert Square. Chairman's inaugural address.

**(Scottish Local Section).**—Tuesday, November 14th. At 7.30 p.m. At 207, Bath Street, Glasgow. Chairman's inaugural address.

**(Newcastle Local Section).**—Monday, November 13th. At 6.45 p.m. At the Mining Institute. Chairman's inaugural address.

**Liverpool Engineering Society.**—Wednesday, November 15th. At the Royal Institution, Colquitt Street. Paper on "The Civil Engineering Profession and some Economic Problems," by Mr. J. Glover.

**Greenock Electrical Society.**—Thursday, November 16th. At 7.45 p.m. At 22, West Stewart Street. Paper, "A Criticism of the I.E.E. Rules," by Mr. H. Piggott.

**Chemical Society.**—Thursday, November 16th. At 8 p.m. At Burlington House, Piccadilly, W. Ordinary scientific meeting.

**Institution of Mechanical Engineers.**—Friday, November 17th. At 6 p.m. At the Institution of Civil Engineers, Great George Street, S.W. General meeting. Research Committee: Report on the Hardness Tests.

**Batti-Wallahs' Society.**—Friday, November 17th. At 6.30 p.m. At Victoria Mansions Restaurant, Victoria Street, S.W. Informal Reunion. Dinner at 7 o'clock, Mr. W. Wyld presiding. Members are asked to communicate with the secretary stating whether they will be present and the number of guests.

**Junior Institution of Engineers.**—Friday, November 17th. At 8 p.m. At 39, Victoria Street, S.W. Paper on "How to Memorise Formulæ," by Mr. E. Fiander Etchells.

## NOTES.

**To Engineering and Allied Contractors.**—The Ministry of Munitions is desirous of extending the output of :—

Casting and Stamping Fuse Bodies and Sockets.
Casting and Rolling Brass Rods for the Components.

Firms possessing suitable machinery and capable of undertaking such work, are requested to communicate at once with the Central Clearing House for Engineering Resources, Ministry of Munitions, 8-9, Northumberland Street, Northumberland Avenue, W.C.

**Lighting in Picture Theatres.**—The Middlesex County Council Licensing Committee proposes to insert in the licences for kinemas a requirement that the building shall be so lighted that it shall be possible to see clearly over the whole of the auditorium throughout the whole of the performance.—*The Times.*

**"Callender's Staff Service Gazette."**—We have received a copy of No. 8 of *Callender's Staff Service Gazette* (October, 1916), in which the full list is given of staff and employés of Callender's Cable and Construction Co. who are with the Colours. The editorial notes contain a great deal of very interesting information regarding the movements and experiences of the men who have been wounded or laid down their lives in the service of the country. Many letters from the men are published. A Supplement shows an excellent portrait of the late Mr. W. O. Callender, the founder of the company.

**Appointments Vacant.**—Boiler house superintendent for Rochdale; charge engineers for a public supply undertaking (certified), £130 ÷ 7½ per cent. war bonus. See our advertisement pages to-day.

**Siemens Bros. & Co., Ltd.**—Mertons and the Marconi Co.—In reply to a Parliamentary question, on Wednesday, Mr. Pretyman said that Mr. George Chauvin was the managing director of Siemens Bros., Ltd., but Mr. Carl von Siemens was no longer a director. The firm was a controlled establishment doing Government work, and was under a supervisor. "It is greatly to the national interest that this business should be acquired by those British firms who can make the best use of it for the future development of the electrical industry of this country. Active steps to that end are now in progress, and in the meantime it is clearly necessary that the business should be fully maintained."

Mr. Pretyman also stated that Messrs. H. R. Merton & Co. had applied to be reinstated on the ground that the German interest was now eliminated.

Mr. Runciman, in reply to a question, says that he is informed by the Marconi Co. that certain of their directors were before the war on the Board of the Deutsche Betriebsgesellschaft fur Drahtlose Telegraphie of Berlin, in which the Telefunken Co. holds the majority of the shares. He was informed by the Marconi Co. that they had not considered it in their interests to publish in their yearly accounts lists of their holdings in other companies since 1913, but that the information was at all times available to their shareholders. The Marconi Co. in 1913 concluded an agreement of a commercial nature between them and the Telefunken Co., which dealt in some matters with Australia, New Zealand, and Spain, but did not embrace the United States. This agreement has not been operated since the beginning of the war.

**Electrical Goods in South Africa.**—The *South African Export Gazette* says that electrical goods made in Japan are now being sold in South Africa. "The factory prices are even cheaper than similar goods of German origin in the pre-war days." Our contemporary says that electrical goods are arriving in South Africa from the United Kingdom more freely now, but contracting work has not improved.

**An Industrial Truce for Three Years.**—With reference to the proposal that Capital and Labour shall through their respective representative organisations adopt an industrial truce for three or five years, to which we have alluded on several occasions, the *Times* in its "Political Notes" states that a short time ago the Parliamentary Committee of the Trades Union Congress asked the Employers' Parliamentary Committee to meet them in order to consider the resolutions on post-war problems passed by the Congress at Birmingham in September. It has now been arranged, says our contemporary, that representatives of the two Committees shall meet in London next week to survey the ground. "If they can arrive at a preliminary understanding the full bodies will, no doubt, hold a joint conference without further delay. The movement is of the first importance. The resolution of the Congress on which the Parliamentary Committee are acting instructed them to approach the Government and the employers with the object of discussing terms that would secure industrial peace for three years after the war."

**Banks and Industry.**—Speaking at the meeting of the Russian Corporation recently, Mr. A. W. Tait, the chairman, said :—

"We have read a great deal recently about the necessity for financial assistance for the development of British industry after the war. I do not think we need infer from this that the industrial interests of this country have not received proper banking facilities or support from the existing joint-stock banks, because I believe they have been admirably supported in this connection. There is, however, a feeling that something more than this is necessary, particularly in financing the development of railways and public works in the various countries of the world, in which British enterprise, ability, and experience are well able to take their part. Dealing for the moment with Russia, I am inclined to think that the existing institutions are able, in a very large measure, to supply the financial assistance required, and they are able and willing to grant facilities for the development of trade between the two countries. This might be further increased if there were a greater measure of reciprocity and co-operation, thereby preventing a considerable amount of overlapping and unnecessary competition. A great deal has been said about the necessity for Government assistance to financial institutions, but, personally, I do not see the necessity for this, particularly with regard to Russia, because the institutions are already in existence, and any step which might be taken either as regards assistance to or recognition of one institution would be manifestly unfair, and would have a prejudicial effect on the activity and usefulness of the other institutions which are probably quite as favourably situated to carry out business. The British Government could be of more real help to these institutions by instructing its Ambassadors and Consular representatives in the various countries to assist, when required, the British institutions to enable them to obtain the business in competition with the financial institutions of other countries which have in the past obtained this support. By this means there would be not only profitable employment for British capital, but proper safeguards could be made whereby such capital as might be required for the purchase of materials and plant would be utilised as far as possible for the benefit of British Industry. In the past many issues have been made in this country where the British investor has been asked to subscribe the capital and the proceeds have been spent in foreign countries—notably in enemy countries. We must, therefore, benefit from the lessons of the past, and see that in future where this country supplies the money the interests of British industry are properly safeguarded. If proper regulations are made and the various banks and financial institutions of Great Britain insist on their being carried out where loans are granted and when new enterprises are financed, this would be a most effective means of counteracting the hold which certain enemy institutions and industries had upon the greater part of the trade of the world."

Mr. Pretyman, in reply to a Parliamentary question, hopes that active steps will be taken to set up the British trade banking organisation suggested by Lord Faringdon's committee.

**Volunteer Notes.**—First London Engineer Volunteers.—Orders for the week by Lieut.-Col. C. B. Clay, V.D., Commanding.

*Monday, November 13th.*—Technical for Platoon No. 9, at Regency Street. Squad and Platoon Drill, Platoon No. 10. Signalling Class. Recruits' Drill, 6.25—8.

*Tuesday, November 14th.*—School of Arms, 6—7. Miniature Range, 5.30—7.30. Lecture, 7.15, "The Service Rifle," Platoon Commander A. Gerard.

*Wednesday, November 15th.*—Instruction Class, 6.15. Miniature Range, 5.30—7.30. Platoon Drill, Platoon No. 3.

*Thursday, November 16th.*—Platoon Drill, Platoons Nos. 5 and 6. Ambulance Class, 6. Miniature Range, 5.30—7.30.

*Friday, November 17th.*—Technical for Platoon No. 10, Regency Street. Squad and Platoon Drill, Platoon No. 9. Signalling Class. Recruits' Drill, 6.25—8.25.

*Saturday, November 18th.*—N.C.O.'s Class, 2.30, Company Commander Castell.

*Sunday, November 19th.*—Entrenching at Otford.—Parade Victoria (S.E. & C. Railway Booking-office), 8.45 a.m.

*Inspection.*—The Corps will be inspected on November 25th by Sir Desmond O'Callaghan. A full muster is highly important. Parade, 2.20. Uniform.

(By order) Macleod Yearsley, *Adjutant.*

3rd (Old Boys') Corps) Batt. County of London Volunteer Regiment.—Battalion Orders by Major R. J. C. Eastwood (Commandant), Monday, November 6th, 1916 :—

*Entrenching Duties* will be performed on Saturday and Sunday next, 11th and 12th inst.

*Recruits' Drill*, under Company Sergt.-Major Bretterth, will be held on Mondays, Wednesdays and Fridays at the Royal Exchange, E.C., at 5.30—7 p.m.

*Tuesdays.*—7.15—8.15 p.m., at the London Scottish Drill Hall, Buckingham Gate.

*Thursdays.*—7.30—8.30 p.m., at the London Scottish Drill Hall.

Daily recruit drills at Lord's Cricket Ground, under Sergt.-Major Alexander, as follows :—9.30 a.m.—10.30 a.m.; 11 a.m.—12.15 p.m.; 3 p.m.—4 p.m.

Evening recruit drills at Yeomanry Hall, Henry Street, St. John's Wood, under Sergt.-Major Alexander, on Tuesdays and Thursdays, 6 p.m.

*Enrolment of Recruits.*—The C.O. will be at Headquarters, Lord's, on Mondays, Wednesdays, and Fridays to enrol recruits, at 6—7 p.m., and to interview any men who wish to see him.

G. H. F. Duncan, *Adjutant.*

**The Hardship of Premature Call-up Notices.**—At a meeting of the Military Service Committee of the London Mercantile Chamber, held at 44, Bedford Row, W.C., on the 2nd inst., the following resolution was carried unanimously :—

That the War Office be petitioned to make such regulations as will relieve the financial hardships incidental to men who have been notified that they may be called up (but who are not to understand that they will certainly be called up, and are asked to continue their civil employments), when such men, after the final decision of a Tribunal, are exempted for a certain time only, and sell their businesses or in consequence of their position leave their employments to hold themselves in readiness for their call and are obliged to live on their capital. If not eventually called up, such men can, under present regulations, have no allowance made them for their wives and children, and this Committee respectfully submits that great hardship ensues, and that steps be at once taken to remedy the grievances indicated.

**Wages in Australia.**—According to an Australian Government return just received in London, the following are the wages fixed by Award Courts for adult male electricity supply, &c., workers for a 48-hour week :—

Sydney.—Electrical installation.—Armature winders, 72s. ; cable jointers, 72s. ; fitters, 74s. ; linemen, 66s. ; mechanics, 66s. ; wiremen, 64s. ; other adults, 57s. Electrical Supply.—Armature winders, 72s. ; cable jointers, 74s. ; carboner (arc lamp attendant), 54s. ; instrument makers, 70s. ; linemen, 66s. ; meter fixers, 66s. ; meter testers, 70s. ; patrolmen (night), 60s. ; shift electrician, 74s. ; switchboard attendants, 60s. ; other adults, 57s. Electrical Trades.—Fitters, 74s. ; mechanics, 66s. ; wiremen, 64s.

Melbourne.—Armature winders, 66s. ; cable jointers, 69s. ; fitters, 66s. ; linemen, 63s. ; mechanics, 63s. ; patrolmen, 63s. ; wiremen, 63s. ; wireman's assistant, 56s. ; other adults, 56s. Electrical Supply.—Armature winders, 54s. and 63s. ; cable jointers, 63s. ; carboner (arc lamp attendant), 54s. ; instrument makers, 63s. ; linemen, 60s. ; meter fixers, 55s. 6d. ; meter testers, 63s. ; patrolmen (night), 66s. ; shift electrician, 66s. ; sub-station attendants, 60s. ; switchboard attendants, 54s. ; switchmen, 52s. 6d. ; other adults, 51s. Electrical Trades.—Fitters, 66s. ; mechanics, 63s. ; wiremen, 63s.

Brisbane. — Electrical Installation.—Armature winders, 63s. ; cable jointers, 69s. ; fitters, 69s. ; linemen, 60s. ; mechanics, 60s. ; wiremen, 60s. Electrical Supply.—Armature winders, 63s. ; cable jointers, 69s. ; carboner (arc lamp attendant), 57s. ; instrument makers, 69s. ; linemen, 60s. ; meter testers, 69s. ; shift electrician, 63s. and 76s. ; sub-station attendants, 54s. Electrical Trades.—Fitters, 69s. ; mechanics, 69s. ; wiremen, 60s.

Adelaide.—Electrical Installation.—Armature winders, 66s. ; cable jointers, 60s. ; fitters, 66s. ; linemen, 60s. ; mechanics, 60s. ; patrolmen, 60s. ; wiremen, 51s. ; other adults, 48s. Electrical Supply.—Armature winders, 66s. ; cable jointers, 60s. ; carboner (arc lamp attendant), 48s. ; instrument makers, 60s. ; linemen, 60s. ; meter fixers, 51s. ; meter testers, 60s. ; patrolmen (night), 60s. ; switchboard attendants, 48s. ; switchmen, 54s. ; other adults, 48s. Electrical Trades.—Fitters, 66s. ; mechanics, 60s. ; wiremen, 51s.

Perth.—Electrical Installation.—Armature winders, 72s. ; fitters, 72s. ; linemen, 63s. ; mechanics, 72s. ; wiremen, 66s. ; other adults, 54s. Electrical Supply.—Armature winders, 72s. ; instrument makers, 72s. ; linemen, 63s. Electrical Trades.—Fitters, 72s. ; mechanics, 72s. ; wiremen, 66s.

Hobart.—Electric Installation.—Armature winders, 63s. ; cable jointers, 60s. ; fitters, 63s. ; linemen, 54s. and 57s. ; mechanics, 63s. ; patrolmen, 60s. ; wiremen, 57s. ; wireman's assistant, 51s. ; other adults, 51s. Electrical Supply.—Armature winders, 63s. ; cable jointers, 60s. ; carboner (arc lamp attendant), 54s. ; instrument makers, 63s. ; linemen, 54s. and 57s. ; meter fixers, 51s. ; meter testers, 60s. ; patrolmen (night), 60s. ; sub-station attendants, 63s. ; switchboard attendant, 51s. Electrical Trades.—Fitters, 63s. ; mechanics, 63s. ; wiremen, 57s.

**Electro-Harmonic Society.**—The next Concert (Ladies' Night) will be held at the Holborn Restaurant (King's Hall), on Monday, November 20th, commencing at 6.15 p.m. The artistes will be as follows :—Soprano, Miss Olive Sturgess ; contralto, Miss Dorothy George ; bass-baritone, Sapper Joseph Farrington (by desire) ; solo violin, Miss Mary Law ; light-comedy entertainer, Miss Mabel Adeane ; Canadian entertainer, Mr. W. V. Robinson ; entertainer at the piano, Mr. Harrison Hill ; solo pianoforte and accompanist, Mr. Bernard Flanders, A.R.A.M. Evening dress is optional.

**Institution and Lecture Notes.—Birmingham and District Electric Club.**—Mr. J. J. Richardson read a paper on "Sand-blasting and Sand-blast Machines" at a recent meeting of the club. He said that the sand-blast process was invented in 1870 by Mr. B. C. Tilghman, of Philadelphia. The abrasives used in the process include ordinary inland silicious sand, sharp builders' sand, powdered glass, emery from fine to coarse, chilled iron sand, and steel shot, and the streams of these "sand-blasting" mediums are forcibly projected through variously formed nozzles by means of steam, and by currents induced by exhaust air or compressed air. The action is extremely rapid ; a momentary application depolishes glass over any space that can be covered by one stroke of the sand shower, instantly changing the previously bright surface to obscured. Stone, marble, slate and granite are equally amenable to its action. Iron, steel and other metals have their surfaces easily reduced and smoothly or coarsely granulated, according to the force and abrasive used ; but all these materials, being less brittle than glass, take rather longer time.

The sand-blast process was first used in connection with glass marking and obscuring, and is to-day largely employed in the glass trade. It is in constant use for obscuring or producing a uniform granulation known as ground glass, on sheet glass, lamp and gas globes, the bulbs for incandescent electric globes and the like ; also for the decoration of sheet or objects in glass with ornamental designs in which the pattern or the field may be left bright and transparent, of which there are numerous varieties, one being a glass of two or more thicknesses of different colours, to leave the design of one colour on a field of another, for perforating sheet and plate-glass for ventilators, or otherwise engraving and marking glass, bottles, advertising tablets, &c.

In using the process for engraving, lettering, or perforating glass, stone, &c., the parts of the surface which are not to be acted upon by the sand-blast are protected by various elastic and tenacious substances, varying in thickness and durability, according to the depth of the cutting required and the brittleness of the material under operation. The more elastic this protecting substance, the less will be the impression made upon it by the sand-blast. For engraving table-glass, bottles, lamps, globes and chimneys, and small articles in sheet-glass, a stencil is usually made of thin sheet-iron or steel, worked to the proper shape, and fitted on the article during the operation. These stencils, with care, last a long time, and about 2,000 impressions can be made with one stencil. For engraving advertising tablets, door panels and sheet-glass, an adhesive material is pressed upon the glass through a tinfoil stencil. For a better class of work the glass is covered with prepared paper, upon which the design is sketched, and then cut out by hand.

The sand-blast process is also applied to the cleansing and finishing of new files, and is now found in nearly all the large file works in the country. In the metal trades the sand-blast is used for the removal of the hard scale so destructive to cutting tools, from castings, forgings, stampings, &c., also for the removal of the scale from sheet-iron and steel prior to enamelling, galvanising, nickelling, tinning, &c., the cleaning of tubes and brazed joints largely used in cycle works, and the reduction to clean metal surfaces of larger parts. For large work in metal, say, for the removal of scale from armour plates, it is generally necessary to take the sand-blast to the work. The portable plant is used also for cleaning the ends of electric tramway rails before welding *in situ*, &c.

Such work as the cleaning of the brazed joints of cycle frames, twist drills, and hardened steel parts, frosting the inside of cigarette cases before gilding, and frosting such things as carburettor bodies before plating, is done in sand-blast chambers. These vary in size according to the work required to be done. The operator stands outside the chamber, and passes his arms through suitable openings, directing the blast on the articles to be cleaned, and observing the results through the window in front of which he stands. Special types of sand-blast machines are made for many purposes, including the cleaning of the inside of shells.

**University College, London.**—In the second of his series of lectures on "Long-distance Telephony," on Friday last, Prof. J. A. Fleming dealt with the conditions governing the flow of alternating-current waves through a cable and the methods of effecting the calculations involved. A brief explanation of the nature and mode of use of vectors led up to a demonstration of the vector-calculating rule devised by the author (described in the *Journal* I.E.E., Vol. 52, No. 236), which greatly facilitated vector calculations for preliminary purposes, though not so accurate as the detailed and laborious calculations otherwise necessary. Pointing out that the formulæ could be simplified by the use of exponential expressions, Prof. Fleming proceeded to explain the nature of the hyperbola and hyperbolic functions, and substituting the latter in the fundamental equations, arrrived at the final forms—$V_1 = V_2(\cosh p l + z/z_r . \sinh p l)$, $I_1 = I_2(\cosh p l + z_r/z . \sinh p l)$, with which the values of $V_2$ and $I_2$ could be obtained from those of $V_1$ and $I_1$, $l$ being the length of the line and $z_r$ the impedance of the receiving apparatus. The factors between brackets being complex quantities, the calculations must be made vectorially, and cosh $p l$, for instance, had to be converted to the form cosh $(\alpha l + j\beta l)$, leading finally to the form cosh $\alpha l$/cos $\beta l$ + sinh $\alpha l$ sin $\beta l$, $\alpha$ being the "attenuation constant" and $\beta$ the "wave-length constant." In dealing with these expressions, tables and curves published by the lecturer in the I.E.E. paper above mentioned were useful. Unless $\alpha l$, the attenuation length, was less than $4\frac{1}{2}$, speech through a cable was not possible. It was shown that $\alpha$ increased with the frequency, and $\beta$ also increased, but much faster than $\alpha$ ; the former indicated the rate at which the potential was attenuated in a long cable, whilst the latter determined the interval $(2\pi/\beta)$ at which the value of the potential recurred (except as attenuated) in the same phase throughout the length of the line. The nature of the transmission was aptly illustrated by a model consisting of a spiral row of radial rods, with lengths in geometrical progression, attached to a rotating spindle. As the frequency of the alternations increased the wave-length $(\lambda = 2\pi/\beta)$ diminished, and the velocity of the wave increased, tending to a maximum value ; $\alpha$ also tended to a maximum. As the short waves travelled faster than the long waves and attenuated more quickly, the waves were distorted in their passage along the cable, the harmonics disappearing, with the result that speech eventually became unintelligible. Heaviside had shown that if $L S = C R$, or $R/L = S/C$, the formulæ for $\alpha$ and $\beta$ reduced to the simple forms $\alpha = \sqrt{S R}$, $\beta = p\sqrt{L C}$, so that all the waves attenuated at the same rate and travelled with the same velocity ; such a cable would be distortionless, but in ordinary cables, while $R/L$ was of the order 88,000, $S/C$ was about 100. The late Prof. S. P. Thompson had suggested increasing S, but this, unfortunately, increased $\alpha$. C was decreased by the invention of dry-core cable, and R could be reduced by increasing the copper section, but commercial and technical considerations set a limit to this. Finally L could be increased, and the method of accomplishing this had received close attention during the past 15 years. Iron wire could be wound over the cable, but tended to increase C and the effective value of R. The work of Pupin, published about 1899, afforded a solution to the problem by adding inductance to the line at intervals.

**Royal Society of Arts.**—The following are among the meeting arrangements announced in the session's programme :—

November 22nd, at 4.30.—Leslie Urquhart, "The Economic Development of Russia and Britain's Share Therein."

December 6th, 4.30.—C. M. Whittaker, B.Sc., "The Coal-Tar Colour Industry."

December 13th, at 4.30.—H. Wilson Fox, "The Development of Imperial Resources."

December 20th, at 4.30.—A. C. Benson, C.V.O., "Classical and Scientific Education."

At an after-Christmas meeting, Mr. J. H. Vickery will deal with "German Business Methods."

The Howard Lectures on November 27th, December 4th and 11th

(afternoon), will be delivered by Prof. J. S. S. Brame, on "Coal and its Economic Utilisation," and Prof. W. Ripper, on April 23rd, 30th, and May 7th, will give three lectures on "Works Organisation and Efficiency."

**Institution of Electrical Engineers (Birmingham Local Section).**—The provisional programme for this Section contains the following items, one meeting per month being arranged for :—

November 15th.—Dr A. Russell's Kelvin Lecture.
December 6th.—Mr. J. S. Peck, on "The Parallel Operation of Electric Power Stations."
January 13th.—Messrs. F. Gill and W. W. Cook on "Principles Involved in Computing the Depreciation of Plant."

The meetings are to be held at 7 p.m., at the University, Edmund Street.

**Institution of Electrical Engineers (Manchester Local Section).**—The programme for the first half of the session, which opens on November 14th with an address by the chairman, Mr. A. E. McKenzie, has been issued. The definite fixtures are :—

November 28th.—J. S. Peck, "The Parallel Operation of Electric Power Stations."
December 12th.—A. P. M. Fleming, illustrated lecture, "Some Aspects of Industrial Research, with Special Reference to American Research Activities."
January 17th.—F. Gill and W. W. Cook, "The Principles Involved in Computing the Depreciation of Plant."
January 30th.—J. Drummond Paton and J. Frith, "Fuel Economy."

**Institution of Electrical Engineers (Scottish Local Section).**—The programme for the session has been issued as follows :—

November 14th.—Glasgow. Chairman's Inaugural Address (J. K. Stothert).
December 12th.—Glasgow. J. S. Peck, "Parallel Operation of Electrical Power Stations."
January 9th.—Edinburgh.
February 16th.—Edinburgh. Kelvin Lecture, Dr. A. Russell.
March 13th.—Edinburgh.
April 3rd.—Glasgow.

At the Glasgow meeting next Tuesday Mr. C. P. Sparks, president will be present. The Students' Section will not meet this session.

**South African Institute of Electrical Engineers.**—At the meeting of the Institute on September 20th, Prof. W. Buchanan, who presided, announced that the Council had decided that enemy subjects were ineligible for membership of the Institute. Any known enemy subject who might previously have been admitted had been removed from the roll of members. Afterwards Mr. C. J. Everett, on behalf of Major Dobson, read a paper on the main switchboard of the Johannesburg municipal electricity supply system.

**Association of Mining Electrical Engineers.**—The new session of the West of Scotland Branch opened at Glasgow on October 28th with the address of the president, Mr. J. B. Thomson. The syllabus for the session is as follows :—

November 11th.—Lecture on "Friction Surfaces," by J. Oswald; demonstration of oxy-acetylene welding, by W. L. Brown.
December 16th.—Social evening.
January 20th.—"Modern Switch and Fuse Gear: its Defects and Some Suggested Remedies," by A. M'Phail.
February 17th.—"Electrical Converters," by C. S. Buyers.
March 17th.—"Maintenance of Underground Plant," by M. Baird, jun.

**Royal Institution.**—At a general meeting of members held on Monday, Dr. H. E. Armstrong, Ph.D., F.R.S., was elected a manager in place of the late Prof. S. P. Thompson.

**Legal.**—Victoria Falls and Transvaal Power Supply Co., Ltd., *v.* Brakpan Mines, Ltd., and The Consolidated Mines Selection Co., Ltd.—In the Rand Division of the Supreme Court in September, Mr. Justice Ward delivered a lengthy judgment (12? type-written pages) in this case. The action, as reported in the issue of October 6th, 1916, related to contracts for the supply of power. In the result judgment was entered for the plaintiffs for £692, and costs.

Electric Ambulance or Motor-Car?—An interesting case came before the Hampstead Magistrates on Wednesday morning last, when Mr. Geo. Elieson, the inventor of the handy little electrically-propelled bath chair, which was described in our issue of March 17th last, was summoned for driving this little carriage without a registration plate attached, and for not holding a driver's licence; and Mr. Thompson, manager of Messrs. Carters, the well-known surgical engineers, makers of the Elieson-Carter electric invalids' carriage, was summoned for aiding and abetting him.

The evidence showed that the carriage was on a trial run, with Mr. Thompson walking beside it, and that no permission to use it had been obtained. For the police, it was stated that in a previous case, a motor tricycle capable of being propelled by steam had been deemed a motor vehicle within the meaning of the Act.

Counsel, representing defendants, said no doubt this was so, but the question was whether an invalid chair was the same thing; he also pointed out that the Local Government Board had written stating that a decision in the matter could only be determined by the Courts.

Evidence was given by Mr. Thompson as to the construction of the carriage, which could be drawn by hand, if desired, in the ordinary way. He pointed out that his firm were anxious to have some decision on the matter, and had had considerable correspondence with the Customs, Local Government Board, and the L.C.C., and this was summed up in the reply received from the Local Government Board mentioned above. The carriage had on previous occasions made similar runs with a maker's registration plate.

Counsel, addressing the Bench, pointed out the novelty of the appliance. Acts were passed to deal with the state of things existing at the time, and it was never contemplated at the time the particular Act was passed that a harmless little vehicle of that kind would come within the Act. If they had to decide between calling it a motor-car and an ambulance, all bounds of reason were on the side of the ambulance, and if they decided so, then it was not subject to any duty. The carriage only required ¼ H.P. to drive it, and for it to be regarded as a motor-car it would have to be presumed that it was of a H.P. exceeding 6½ and under 12 (according to the Act), which was an absurdity.

The Bench decided that it was not an ambulance, but inflicted nominal fines, as they regarded it as a test case. They also agreed to state a case.

**Fatalities.**—Coroner Graham held an inquest at Dunston-on-Tyne on November 3rd on the body of John Ratcliffe, aged 37, an electric wireman in the employ of the Electro-Flex Steel Co. at Dunston. The evidence was to the effect that on the 1st inst. Ratcliffe was engaged in taking down some disused wires when he was found by James Wood, a craneman, in a sitting position, apparently dead. Mr. J. A. Anderson, engineer, said that on examination he found that a fuse had been left in, which, in his opinion, was the cause of the accident. He regarded it as a terrible mistake on Ratcliffe's part. The jury found that death was due to asphyxia the result of an electric shock, received while attempting to cut a "live" wire.

Mr. T. Dowdall, who was accidentally killed during his employment at Queensferry, on Saturday last, was partner with his father, Mr. J. Dowdall, as an electrical contractor, at Gloucester Street, Dublin.

Sergeant-Major Reginald Dutchman, R.F.C. (T), an electrical engineer holding a position in a Government works, was examining his automatic pistol, when it exploded, and he received the charge just below the heart. He died in hospital.

Thomas Sullivan (26) was killed on the L. & Y. Railway, near Crumpsall, Manchester, on Friday afternoon last. He was an electric cable jointer employed by the railway company, and apparently he had touched a live rail whilst at work.

**Society of Engineers (Inc.).**—A paper on "Heating and Ventilating Private Dwelling-Houses" was read by Mr. C. T. A. Hanssen on Monday last.

**King's College, London.**—On Wednesday, last week, Mr. James Swinburne, F.R.S., read a lecture on "Science and Industry," dealing specially with the relations between academic and applied science.

**Gas on Trains.**—Reporting on a collision between two passenger trains at Warminster, on the Great Western Railway, on September 2nd, Major Pringle, the Board of Trade Inspector, stated that it afforded a further illustration of the risk of gas as an illuminant. The ignition of the gas on the Bath train was caused by a passenger striking a match.

**Electrical Men's Wages at Dublin.**—The Dublin Corporation, at its meeting on Monday, refused to suspend the standing orders on a motion by Alderman Byrne, M.P., for the purpose of considering a joint report of the Electricity Supply Committee and the Municipal Workshops Committee with respect to the application of the members of the A.S.E., who are employés, for an increase of wages.

Mr. J. Kelso, secretary to the Society, had intimated that if the wages were not increased, so as to bring them up to the scale paid by the city firms, the men would be withdrawn from service.

The Council's law agent stated that, as requested, he had made inquiry in the matter, and found that the rate paid by employing firms was 38s. 3d., with a war bonus of 4s. for a 51-hours' week. The Corporation was paying, before an award by Sir John Griffith, 38s. 6d. under the Workshops Committee, and 38s. 3d. under the Electricity Committee, with a war bonus of 3s. per week. These figures were raised after the award to 40s. 9d. and 40s. 4½d., with 3s. war bonus, for a 50-hours' week. The Electricity Committee was, in addition, paying a walking allowance; and Corporation employés had certain advantages which were denied to Trade Unionists outside—such as permanent employment in the case of the majority; no insurance payments; the latter, under a scheme entered into by the Corporation under the Insurance Commissioners, and applying both to health and unemployment insurance; payment in absence through illness on a generous scale, with pension on disablement; annual leave, one week or two weeks according to term of service, with pay; and double pay for bank holiday work, or payment for bank holiday when off duty. The Agent therefore advised that if the members in Corporation employment based their claim on the A.S.E. scale, as arranged with the Employers' Association, they were not entitled to any of these benefits.

The Corporation decided, on the Law Agent's report, not to consider the joint report.

**Linking-up of Electricity Undertakings.**—At a meeting held in Glasgow on November 3rd, when representatives from fifteen electrical undertakings in the West of Scotland attended, it was decided to appoint a Committee to discuss the question of linking-up electricity undertakings. Mr. Geo. Balfour (Scottish Central Electric Power Co.) was elected chairman and Mr. Whysall (Greenock) vice-chairman and secretary; all those invited to the meeting were appointed to the Committee, and the following Sub-Committee was nominated, with the chairman and secretary, as members, *ex officio* :—Messrs. Lackie, Starr, Churchward, Parkinson, Bexon, Brown and Wishart.

**Foreign Trade.**—The October Figures.—The official returns of imports and exports during last month contain the following electrical and machinery figures :—

| | *Oct.*, 1916. | *Inc. or dec.* | *Ten months*, 1916. *Inc. or dec.* |
|---|---|---|---|
| Imports :— | | | |
| Electrical goods, &c. | £135,566 | + £48,797 | + £473,462 |
| Machinery ... ... | 551,639 | + 30,657 | − 550,772 |
| Exports :— | | | |
| Electrical goods ... | 364,788 | + 118,948 | + 1,043,561 |
| Machinery ... ... | 1,820,929 | + 316,949 | + 571,580 |

**U.S. Power Company's Wireless Plant.**—The Montana Power Co. has installed a wireless station at its Rainbow plant, near Great Falls, as an auxiliary means of communication when telephonic service is interrupted. It is expected that a considerable sum of money will be saved on long-distance tolls when the private lines are down.—*Electrical World.*

**Use of Coke-oven Gas Under Boilers.**—With reference to the article on the above subject which appeared in our issue of October 27th, we are asked by Mr. Wilson, of the Cumberland Gas Burner Co., in order to avoid any misconception, to state that the burner referred to by us as the "Altenhein burner" is known and sold in this country as the "Cumberland burner," and that Mr. Altenhein is not concerned in the management of the company, and lives in America.

## OUR PERSONAL COLUMN.

*The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the* ELECTRICAL REVIEW *posted as to their movements.*

**General.**—According to the *Times*, the Vice-Chancellor of Cambridge University has appointed Mr. R. T. GLAZEBROOK, C.B., Fellow of Trinity College, Director of the National Physical Laboratory, to the office of Reader on Sir Robert Rede's foundation for the ensuing year.

Mr. HENRY TERRY, Jun., electrical engineer, of Coventry, has been admitted a Freeman of the city.

The many friends of Mr. H. J. HAWKINS, who a few years ago resigned the appointment of borough electrical engineer to the Salford Corporation, will be pleased to know that he has accepted an appointment at Karachi as chief engineer to a London firm. Mr. Hawkins sailed for India on October 29th.

The following Civil Service appointment is announced in the *Gazette*:—Admiralty: First assistant electrical engineer in H.M. Naval Establishments, E. E. BENHAM.

The marriage took place at Manchester, on the 3rd ult., of Private WILLIAM TOWN, A.S.C. (late of Portsmouth Corporation tramways) and Miss Lucy Glynn, of Brooklands, Cheshire.

**Roll of Honour.**—The *Times* states that Captain HAMILTON S. HARRIS, Sherwood Foresters, reported killed on July 1st, was the youngest son of the late Mr. H. Graham Harris, of the late firm of Bramwell & Harris, consulting engineers. He was employed in Canada by the Canadian General Electric Co. at the outbreak of war. His brother, Second-Lieutenant H. Lionel Harris, died of wounds last December.

The death is reported of Private T. W. NEWMAN, Middlesex Regiment, an electrician, and son of a Hornsey electrician.

Private THOMAS DAWES, Grenadier Guards, who was an employé of Messrs. Johnson & Phillips, Ltd., of Charlton, has fallen in action.

Quarter-Master-Sergeant C. EATON, A.O.C., who was on the postal telephonic staff at Enfield, N., has been awarded the Meritorious Service Medal in recognition of valuable services rendered during the war as a volunteer.

Sergeant W. BECKETT HILL, late of the staff of the City of London electric light station, has died of wounds.

First-Class P.O. J. SAUNDERS, R.N., and Corporal S. PARISH, 4th Queen's Royal Surrey Regiment, of the Croydon electricity works staff, and Privates W. S. RUDKIN and H. BLUNDELL, 4th Queen's, and Private J. E. KARN, Army Service Corps Motor Transport, of the tramway staff, have fallen in action.

Bombardier E. H. EMERY, R.F.A., who was on the Rugby staff of the British Thomson-Houston Co., Ltd., has been accidentally killed at Salonika.

Second-Lieutenant H. E. BRITTON, R.F.A., who was in the engineers' department at the Rugby works of the British Thomson-Houston Co., Ltd., has died of wounds, aged 34 years.

Sergeant M. P. O. BROWN, Oxford and Bucks Light Infantry, who was in the foundry department of the British Thomson-Houston Co., Ltd., of Rugby, has fallen in action.

Lance-Corporal E. P. KITTLE, Oxford and Bucks Light Infantry, who has been killed in action, was with the British Thomson-Houston Co., Ltd., at Rugby.

Private A. J. SMITH, Oxford and Bucks Light Infantry, who enlisted from the British Thomson-Houston Works, Rugby, soon after the outbreak of war, has fallen in action.

Private E. MAY, Royal West Kent Regiment, for nine years on the staff of the Exeter Corporation tramways, has fallen in action, aged 26 years.

Sapper PERCY C. GAY, London Field Company, Royal Engineers, who has fallen in action on the Somme, was on the G.P.O. telegraph department engineering staff.

Private A. E. GRIFFITHS, London Regiment, killed in action, was prior to the war engaged with the Telegraph Construction and Maintenance Co., of East Greenwich.

Corporal W. THORNTON, of the West Yorks. Regiment, who has been killed at the Front, was on the clerical staff of the Bradford Corporation tramways department. He was 27 years of age, and the son of a Drighlington contractor.

Sergeant A. E. IRVING, an employé of the Burnley tramways, who won the D.C.M., and was recently awarded the medal of the third class of the Order of St. George of Russia, has been wounded.

Private GEORGE BARWELL, who recently won the D.C.M. in East Africa, is an employé of the Railway Electric Light Department, Cape Town. He is a native of Essex, and went out from England early in 1900.

Private HARVEY MOSS, of the South African Scottish, who recently died of wounds received in France, was an apprentice with Messrs. Edward A. Shaw & Co., electrical engineers, of Cape Town.

Rifleman J. M'GEAGH, Royal Irish Rifles, of Belfast, killed in action, aged 19, was in the electrician's department at Queen's Island before enlisting.

Captain W. E. DOWNEY has been promoted to the rank of Deputy Assistant Director, Ordnance Survey Service. He was formerly electrical engineer at the Pigeon House Fort, Dublin, and is now serving in Salonika.

Lieutenant E. R. WILMSHURST, Royal Fusiliers, son of Mr. T. P. Wilmshurst, chief electrical engineer to Derby Corporation, is in hospital at Rouen suffering from a serious gunshot wound in the head.

**Obituary.**—MR. G. A. OGAN.—We regret to record the death, which occurred suddenly on November 1st, of Mr. G. A. Ogan, who was chairman of the Hackney Borough Council Electricity Committee during the initial stages of the scheme, when the late Mr. Robert Hammond was acting as consulting engineer.

**Will.**—The late Right Hon. EDWARD ARCHDALE, P.C., of Castle Archdale, Irvinestown, co. Fermanagh, described as formerly a civil engineer, who laid submarine cables in various parts of the world, left unsettled personal estate in the United Kingdom valued at £173,698.

## NEW COMPANIES REGISTERED.

**Milton Manufacturing Co., Ltd.** (145,183).—Registered October 28th, by Tippetts, 11, Maiden Lane, E.C. Capital, £60,000 in £1 shares (10,000 pref.). Objects: To carry on the business of mechanical and electrical engineers, manufacturers of and dealers in all things for use in connection with electrical installations, electrolytic processes, electrolytic or chemical bleaching, and other appliances and apparatus, manufacturers of chemicals, chemical products and by-products, &c. The subscribers (with one share each) are: P. W. B. Tippetts, 11, Maiden Lane, E.C., solicitor; J. Martin, 7, Church Road, Brixton Hill, S.W., secretary. Private company. The first directors (to number not less than three or more than seven) are to be appointed by the subscribers. Directors must be British subjects and free from foreign influence. Qualification, £100. Remuneration, £100 each per annum (chairman £150). Solicitors: Tippetts, 11, Maiden Lane, E.C.

**Leabank Manufacturing Co., Ltd.** (145,180).—This company was registered on October 28th, with a capital of £9,500 in 7,500 pref. shares of £1 each and 8,000 ord. shares of 5s. each, to take over, with the authority of the Board of Trade, the business carried on at Hoddesdon, Herts., and elsewhere in England, by P. & F. Doerwaldt, as the Flender Co. (being a business the books and documents of which are liable to inspection under the Trading with the Enemy Act), and to carry on the business of manufacturers of and dealers in wooden and metal pulleys, and other machinery and appliances for use in connection with power transmission, tool makers, engineers, timber merchants, &c.). Clauses for assuring the British character of the company are included in the Memorandum of Association. The subscribers (with one share each) are: G. W. Kent, 521, Barking Road, Plaistow, architect and surveyor; C. F. Tipple, 585, Barking Road, Plaistow, buyer and manager. Private company. The first directors are C. J. Mortimer, Broad Street House, E.C.; F. W. Kent, Broad Street House, E.C.; and C. H. Tipple, 585, Barking Road, Plaistow. Qualification (except first directors), 500 shares. Solicitor: A. Bockett, Amberley House, Norfolk Street, W.C.

## OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

**Bourton-on-the-Water Electric Light & Power Co., Ltd.**—Issue of October 24th, 1916, of £20 debentures, part of a series of which particulars have already been filed.

**Notable Electric Co., Ltd.**—Particulars of £1,000 debentures, created October 9th, 1916, filed pursuant to Section 93 (3) of the Companies (Consolidation) Act, 1908, the amount of the present issue being £150. Property charged: The company's property, present and future, including uncalled capital. No trustees.

**Derby Lamp Works, Ltd.**—A memorandum of satisfaction in full on October 20th, 1916, of debenture dated March 30th, 1916, securing £2,000, has been filed. Second mortgage debenture dated October 20th, 1916, charged on the company's undertaking and property, present and future, including uncalled capital, to secure £5,000. Holders: W. L. T. Arkwright and H. S. Golding.

## CITY NOTES.

**Auckland Electric Tramways Co., Ltd.**

MR. C. G. TEGETMEIER, presiding at the annual meeting at Electrical Federation Offices, London, on October 31st, said that in spite of the adverse conditions the traffic receipts increased by £6,989. They were at the rate of over £10,000 per route mile, and £2 15s. per head of the whole population. The increase in passengers was nearly a million. The completion of the Upper Queen Street extension was anticipated at an early date. They had no further capital in view, beyond that for this extension.

Their capital expenditure in the future must be influenced by a consideration of the fact that their concession from the Auckland City Council expired in 1932, when the Council had the right to purchase about nine miles of route line. The concessions from the various suburban authorities expired at different dates from 1934 onwards. The terms of purchase of both the city lines and the suburban lines were favourable to the company, being based upon going-concern value, but the position would be unsatisfactory if the undertaking had to be split up into divided ownerships. With the great rise in the price of all materials that had taken place during the year, in some cases ranging between 50 and 100 per cent., they had been fortunate in possessing large stocks which were purchased under contracts made before the advance in price. That satisfactory position was one of the many advantages they derived from their association with the British Electrical Federation, which, amongst other services, arranged for the co-operative purchase of stores on behalf of the federated companies. Although they had run an increased car mileage, their actual working expenses showed a substantial decrease. Great credit for the results obtained was due to Mr. Walklate, the general manager, Mr. de Guerrier, the engineer, and the rest of the staff. An item in the expenses over which they had no control was New Zealand income and land tax, which, at £13,984, was £9,041 more than in the previous year. The liability of the company's profits to income-tax both to the New Zealand Government and to the Imperial Government pressed very heavily, and very unfairly, upon the shareholders. The matter has been before the Government, and some measure of relief has been provided in the Imperial Finance Act of 1916. The Government had also promised to set up a committee after the war to inquire into the working of the Income-tax Acts and the question of double income-tax. The report was adopted.

---

**Anglo-Portuguese Telephone Co., Ltd.**—Interim dividend of 3 per cent., less income-tax, on account of the year to December 31st, 1916.

**Indian Electric Supply & Traction Co., Ltd.**—Interim dividend, 2½ per cent., being at the rate of 5 per cent. per annum.

**Edison Swan Electric Co., Ltd.**—According to a lengthy notice appearing in the *London Gazette*, the petition of the company for the confirmation of alteration in its objects already approved by shareholders in meeting in July last, is to be heard on December 12th.

**Dartmoor Electric Supply Co., Ltd.**—At Exeter County Court, on 6th inst., counsel petitioned for the reduction of the capital of this company, which was incorporated in 1910, with an authorised capital of £4,000, divided into 4,000 shares of £1 each. Shares to the number of 2,690 were issued and fully paid, and debentures were issued. There was an overdraft of £800. Counsel said no profit had been made. Owing to depreciation in machinery and other causes, the company had lost its capital to the extent of £1,389, and it desired to reduce its capital by £2,000 by cancelling paid-up capital by 10s. per share, and writing down issued capital to the same amount. The shareholders had approved of the scheme. The Judge granted the order.

**West India & Panama Telegraph Co., Ltd.**—The report states that the amount to credit of revenue is £45,230, as compared with £36,454 in the corresponding half-year of 1915; the expenses have been £33,651, against £27,225. After paying the first and second preference dividends, a dividend on the ordinary shares at 6d. per share (free of tax) for the half-year is to be paid, and £2,280 carried forward. The traffic receipts for the half-year show an increase as compared with those of the corresponding period, business in the West Indies having been active at prices remunerative to the planters. Similar conditions have so far ruled during the current half-year.

**Norway.**—*The Ais Norsk Kabelfabrik*, located at Drammen, recently decided to increase its capital from 300,000 to 1,000,000 kroner. The new capital has been wholly taken up by the old shareholders. The objects of the augmented capital is an enlargement of the works, the site for which has already been acquired at Drammen.

**France.**—*The Société de Duralumin* has increased its capital from 200,000 francs to 1,800,000 francs by the issue of 16,000 100-franc shares, the new capital being allotted to the Société Anonyme d'Aluminium Français and the Société d'Electro-Metallurgie de Dives in varying proportions as consideration for the lease for terms of certain alloy smelting works, the properties of the two latter companies.

## STOCKS AND SHARES.

Tuesday Evening.

The outstanding feature of the past few days has been the violent rise in the price of the 4½ per cent. War Loan—a rise due mainly to the anticipation that the stock will be available for subscription to a forthcoming loan, the advent of which is expected at an early date; while there is also a certain amount of speculative buying in the stock. This advance had the effect of strengthening the lists for Home Railway prior-charge stocks and of checking the downward course which they had been pursuing for the past three weeks.

The American Presidential election has only aroused a languid and transitory interest, so far as the London Stock Exchange is concerned. The days are gone, for the time being, when this contest caused keen excitement in Throgmorton Street, and when the effect of the result was felt upon issues far removed from those of the American railways, which were, of course, most appreciably influenced.

The Home Railway section continues in a state of dull stagnation, although the weakness is scarcely so pronounced as it was. The prices of the Steam companies' ordinary stocks, however, are mostly lower, and the dulness is reflected in a fall of a couple of points in Central London assented ordinary. On the other hand, Underground Electric 6 per cent. bonds are better, although the company's 6 per cent. income debenture stock is still heavy at 101½. The interest on the former, of course, is paid without deduction of tax. From that on the latter the tax is knocked off, which makes a very considerable difference in the flat yield. The stock, of course, is much the better security, *qua* security, of the two; but, having regard to the competition of the Government issues, it seems to be sufficiently high-priced at 101½. Threats of a strike on the London & South-Western, and a possible extension to other lines, make the latest light literature for those who hold Home Railway stocks.

Irritation has been aroused by the non-receipt of some of the letters of allotment in respect of the new issue made by the Consolidated Gas, Electric Light & Power Co. of Baltimore. The latest day for dealing in these was last Friday, as letters could not be shipped later than Saturday if they were to be in time for allotment. British holders of the stocks were told, as usual in such cases, that dealings in the new shares would not be permitted by the Treasury, but that these holders could sell their rights if they wished to do so. This, of course, many did, because the price was 1½–2 premium; and the irritation arose because of the fact that not all of those entitled to the rights received them in time for them to sell.

We understand, unofficially, that any belated arrivals will probably be accepted, although the final date for application has not been altered. Anyway, those who have the right to claim the new issue should immediately take steps to dispose of their letters. The company, we know, values its British proprietary, which is a fairly extensive one, and the directors are anxious that these holders should receive every consideration.

Anglo-American Telegraph ordinary stock shed 3 points, and the preferred is also down 2 at 96. The dulness has nothing to do with the position of the company, but is due to a little stock which has come on the market for deceased accounts. Cable stocks on the whole are firm, the principal favourite of the moment being Western Telegraph, the shares having risen 5s. to 14¾. Eastern ordinary is up a point, but Globes shed ¼ and Great Northerns continue on the down grade, being quoted 10s. lower at 38. There is nothing much doing in Marconis, and at 2¾ the price shows no change.

The only change in electric lighting shares is a fall of ¼ in City of London ordinary, which reduces the price to 11¾. The electric supply companies of the country, it seems, are appealing to the Board of Referees in respect of the excess profits tax, claiming special consideration on account of the limitations and restrictions under which they are working and the fact that in the early stages of the undertakings it is impossible to earn an adequate return upon capital expenditure involved. We should imagine that shareholders in the London electricity companies will observe this with a somewhat pale smile, because the amount of excess profits on which they are likely to be called upon to pay duty may partake of something of the nature of a minus quantity. So far as the provincial undertakings formed of recent years are concerned, no doubt there is more to be said for the companies; but if the percentage is raised, it will, we should think, have only academic interest for proprietors of shares in the London electricity supply companies.

Brazilian Tractions have gone back to 55, losing their rise of last week; and weakness in the British Columbia Electric Railway group is still pronounced. Mexican Light preferred shares are up a point. Vigorous rises have occurred during the past few days in the shares of a number of Canadian-American industrials, although up to the present the issues of the electric power companies have scarcely been affected.

Edison & Swan £3-paid shares fell ¼ to 7s. 6d., and, amongst the big shares, Henleys are lower at 16, British Insulated at 12, showing a fall of 5s. each. The brisk demand for investments which was noticeable in June and July has given place to a more cautious rate of progress, and this, incidentally, forms the principal handle of those who contend that the Chancellor of the Exchequer missed his market in not floating a big popular loan during the summer.

The rubber share market is mending rapidly. There is much keener appetite for shares than there was a fortnight ago; and the effect of the disappointment felt with regard to the excess profits duty, as applied to rubber companies, is quickly wearing off. The iron and steel group is firm; in

fact, manufacturing shares all round are holding their prices with remarkable strength; while in the copper market, most of the shares connected with the metal are quietly improving.

## SHARE LIST OF ELECTRICAL COMPANIES.

| | Dividend 1914. | Dividend 1915. | Price Nov. 7, 1916. | Rise or fall this week. | Yield p.c. |
|---|---|---|---|---|---|
| **Home Electricity Companies.** | | | | | |
| Brompton Ordinary | 10 | 10 | 6⅝ | — | £7 11 0 |
| Charing Cross Ordinary | 5 | 5 | 3⅝ | — | 7 1 4 |
| do. do. do. 4½ Pref. | 4½ | 4½ | 3⅞ | — | 8 6 4 |
| Chelsea | 5 | 4 | 3 | — | 6 18 4 |
| City of London | 9 | 8 | 11¾ | — ½ | 6 14 9 |
| do. do. 6 per cent. Pref. | 6 | 6 | 10½ | — | 5 17 1 |
| County of London | 7 | 7 | 10¾ | — | 6 10 3 |
| do. 6 per cent. Pref. | 6 | 6 | 10½ | — | 5 18 5 |
| Kensington Ordinary | 9 | 7 | 5⅝ | — | 6 4 5 |
| London Electric | 4 | 3 | 1⅜ | — | 6 10 5 |
| do. do. 6 per cent. Pref. | 6 | 6 | 4⅛ | — | 6 11 4 |
| Metropolitan | 3½ | 3 | 2½ | — | 6 0 0 |
| do. 4½ per cent. Pref. | 4½ | 4½ | 3½ | — | 7 4 0 |
| St. James' and Pall Mall | 10 | 8 | 6¼ | — | 6 8 0 |
| South London | 5 | 5 | 2½ | — | 6 16 1 |
| South Metropolitan Pref. | 7 | 7 | 1⅝ | — | 6 7 3 |
| Westminster Ordinary | 9 | 7 | 6⅞ | — | 5 13 0 |
| **Telegraphs and Telephones.** | | | | | |
| Anglo-Am. Tel. Pref. | 6 | 6 | 96 | — | 6 2 4 |
| do. Def. | 30/- | 33/6 | 23½ | — | 7 10 3 |
| Chile Telephone | 8 | 8 | 7 | — | 5 14 5 |
| Cuba Sub. Ord. | 5 | 5 | 8½ | — | 6 8 6 |
| Eastern Extension | 7 | 8 | 13⅜ | — | *5 16 6 |
| Eastern Tel. Ord. | 7 | 8 | 142½ | + 1 | *5 12 1 |
| Globe Tel. and T. Ord. | 6 | 7 | 12⅝ | — ⅛ | *5 13 0 |
| do. Pref. | 6 | 6 | 10½ | — ⅛ | 5 14 3 |
| Great Northern Tel. | 22 | 22 | 38 | — ½ | 5 15 9 |
| Indo-European | 13 | 13 | 51 | — | 6 7 8 |
| Marconi | 10 | 10 | 2⅞ | — | 3 9 8 |
| New York Tel. 4½ | 4½ | 4½ | 98 xd | — | 4 10 0 |
| Oriental Telephone Ord. | 10 | 10 | 2⅝ | — | 4 6 6 |
| United R. Plate Tel. | 8 | 8 | 6¾ | — | *5 18 5 |
| West India and Pan. | 1 | — | 1 | — | — |
| Western Telegraph | 7 | 8 | 14⅜ | + ½ | *5 8 4 |
| **Home Rails.** | | | | | |
| Central London, Ord. Assented | 4 | 4 | 65½ | — | 6 2 2 |
| Metropolitan | 1½ | 1 | 22½ | — | 4 9 0 |
| do. District | Nil | Nil | 16 | — | Nil |
| Underground Electric Ordinary | Nil | Nil | 1⅛ | — | Nil |
| do. do. "A" | Nil | Nil | 5/6 | — | Nil |
| do. do. Income | 6 | 6 | 89½ | + ½ | *6 14 1 |
| **Foreign Trams, &c.** | | | | | |
| Adelaide Sup. 6 per cent. Pref. | 6 | 6 | 4⅛ | — | 6 1 6 |
| Anglo-Arg. Trams, First Pref. | 5½ | 5½ | 3½ | — | 8 9 2 |
| do. 2nd Pref. | 5½ | 5½ | 2¼ | — | — |
| do. 5 Deb. | 5 | 5 | 70 | — | 7 2 10 |
| Brazil Tractions | 4 | 4 | 55 | — 1 | 7 5 6 |
| Bombay Electric Pref. | 6 | 6 | 10½ | — | 5 17 3 |
| British Columbia Elec. Rly. Pfce. | 5 | 5 | 71½ | — ½ | 6 19 10 |
| do. do. Preferred | — | Nil | 53 | —2 | Nil |
| do. do. Deferred | — | Nil | 52 | —2 | Nil |
| do. do. Deb. | 4½ | 4½ | 66½ | | 6 7 10 |
| Mexico Trams 5 per cent. Bonds | — | Nil | 40 | — | Nil |
| do. 6 per cent. Bonds | — | Nil | 83½ | — | Nil |
| Mexican Light Common | Nil | Nil | 17 | — | Nil |
| do. Pref. | Nil | Nil | 31 | +1 | Nil |
| do. 1st Bonds | Nil | Nil | 40 | — | — |
| **Manufacturing Companies.** | | | | | |
| Babcock & Wilcox | 14 | 15 | 22⅝ | — | 5 4 4 |
| British Aluminium Ord. | 5 | 7 | 27 9 | — | 5 15 4 |
| British Insulated Ord. | 15 | 17½ | 13 | — | 7 5 10 |
| British Westinghouse Pref. | 7½ | 7½ | 2½ | — | 6 0 0 |
| Callenders | 15 | 20 | 12½ | — | 8 0 0 |
| do. 5 Pref. | 5 | 5 | 4½ | — | 5 17 8 |
| Castner-Kellner | 20 | — | 8½ | — | 5 6 8 |
| Edison & Swan, £3 paid | Nil | — | 3 8 | — ⅛ | Nil |
| do. do. fully paid | Nil | — | 1½ | — | Nil |
| do. do. 4 per cent. Deb. | 5 | 5 | 62½ | — | 8 0 0 |
| Electric Construction | 6 | 7½ | 1 | — | 7 10 0 |
| Gen. Elec. Pref. | 6 | 6 | 10 | — | 6 0 0 |
| do. Ord. | 10 | 10 | 14½ | — | 6 18 0 |
| Henley | 20 | 25 | 16 | — ½ | 7 16 3 |
| do. 4½ Pref. | 4½ | 4½ | 4½ | — | 5 6 0 |
| India-Rubber | 10 | 10 | 12 | — | *8 3 4 |
| Telegraph Con. | 20 | 20 | 88½ | — | *6 4 7 |

* Dividends paid free of income-tax.

## ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

| Locality. | Month ended (4 wks.) | Receipts for the month. £ | Increase. £ | No. of weeks. | Total to date. £ | Increase. £ | Route miles open. | Increase. |
|---|---|---|---|---|---|---|---|---|
| Bristol (Trams) | Oct. 27 | 20,146 | +1,853 | 43 | 217,106 | + 9,890 | 30·5 | .. |
| Cork | ,, 27 | 2,14( | + 93 | 43 | 22,128 | + 283 | 9·89 | .. |
| Dublin | ,, 27 | 26,112 | +1,898 | 43 | 262.291 | — 986 | 54·25 | .. |
| Hastings | ,, 27 | 3,805 | + 253 | 43 | 46,122 | + 2,970 | 19·3 | .. |
| Lancashire United | ,, 25 | 7,941 | +1,167 | 43 | 79,272 | + 4,073 | 42 | .. |
| Llandudno-Col. Bay | ,, 20 | 1,388 | + 208 | 46⅔ | 17,5?2 | + 1,089 | 6·5 | .. |
| Tyneside | ,, 18 | 2,?66 | + 218 | 16 | 11,247 | + 835 | .. | .. |
| Anglo-Argentine | ,, 28 | 212,710 | +7,548 | 43 | 2,190,543 | + 4,444 | .. | .. |
| Auckland | ,, 20 | 805 | + 22 | 16 | 84,286 | + 1,160 | 26·59 | .. |
| Calcutta | ,, 21 | 18,702 | + 644 | 42 | .. | + 8,651 | .. | .. |
| Kalgoorlie, W.A. | August | 3,021 | .. | 45 | 20,479 | .. | 20.5 | .. |
| * Madras | Oct. 15 | 2,153 | + 205 | 41 | 40,189 | + 2,966 | .. | .. |
| Montevideo | October | 28,729 | +1,545 | 52 | 347,712 | +17,171 | .. | .. |
| Dublin-Lucan Rly. | Oct. 27 | 607 | + 37 | 17 | 3,070 | + 239 | 7 | .. |

* Two weeks.

## MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and they may vary according to quantities and other circumstances.

### Wednesday, November 8th.

| CHEMICALS, &c. | | Latest Price. | Fortnight's Inc. or Dec. |
|---|---|---|---|
| a Acid, Oxalic | per lb. | 1/8 | .. |
| a Ammoniac Sal | per ton | £75 | .. |
| a Ammonia, Muriate (large crystal) | ,, | £54 | .. |
| a Bisulphide of Carbon | ,, | £28 | .. |
| a Borax | ,, | £34 | .. |
| a Copper Sulphate | ,, | £55 | £2 inc. |
| a Potash, Chlorate | per lb. | 2/6 | .. |
| a ,, Perchlorate | ,, | 2/- | .. |
| a Shellac | per cwt. | 13.'/- | 10/- inc. |
| a Sulphate of Magnesia | per ton | £16 | .. |
| a Sulphur, Sublimed Flowers | ,, | £18 | £5 inc. |
| a ,, Lump | ,, | £16 | 10/- inc. |
| a Soda, Chlorate | per lb. | 1/- | .. |
| a ,, Crystals | per ton | 120/- | .. |
| a Sodium Bichromate, casks | per lb. | .. | .. |
| **METALS, &c.** | | | |
| c Brass (rolled metal 2" to 12" basis) | per lb. | 1/3½ to 1/3⅔ | .. |
| c ,, Tubes (solid drawn) | ,, | 1/4½ to 1/5 | .. |
| c ,, Wire, basis | ,, | 1/3⅔ to 1/4 | .. |
| c Copper Tubes (solid drawn) | ,, | 1/7½ to 1/8 | .. |
| g ,, Bars (best selected) | per ton | £169 | .. |
| g ,, Sheet | ,, | £168 | .. |
| g ,, Rod | ,, | £168 | .. |
| d ,, (Electrolytic) Bars | ,, | £144 10 | 10/- inc. |
| d ,, ,, Sheets | ,, | £162 10 | 10/- inc. |
| d ,, ,, Rods | ,, | £153 10 | 10/- inc. |
| d ,, ,, H.C. Wire | per lb. | 1/6½ | ½d. inc. |
| f Ebonite Rod | ,, | 3/- | .. |
| f ,, Sheet | ,, | 2/6 | .. |
| n German Silver Wire | ,, | 2/3 | .. |
| h Gutta-percha, fine | ,, | 6/10 | .. |
| h India-rubber, Para fine | ,, | 3/5½ | 1½d. inc. |
| i Iron Pig (Cleveland warrants) | per ton | Nom. | .. |
| l ,, Wire, galv. No. 8, P.O. qual. | ,, | £36 | .. |
| g Lead, English Pig | ,, | £31 5 | .. |
| g Mercury | per bot. | £17 12 6 to £17 15 | .. |
| e Mica (in original cases) small | per lb. | 6d. to 8/- | .. |
| e ,, ,, ,, medium | ,, | 8/6 to 6/- | .. |
| e ,, ,, ,, large | ,, | 7/6 to 14/- & up. | .. |
| d Silicium Bronze Wire | per lb. | 1/9½ | ½d. inc. |
| r Steel, Magnet, in bars | per ton | £93 | .. |
| g Tin, Block (English) | ,, | £185 10 to £196 10 | 30/- inc. |
| n ,, Wire, Nos. 1 to 16 | per lb. | 2/10 | .. |

Quotations supplied by—

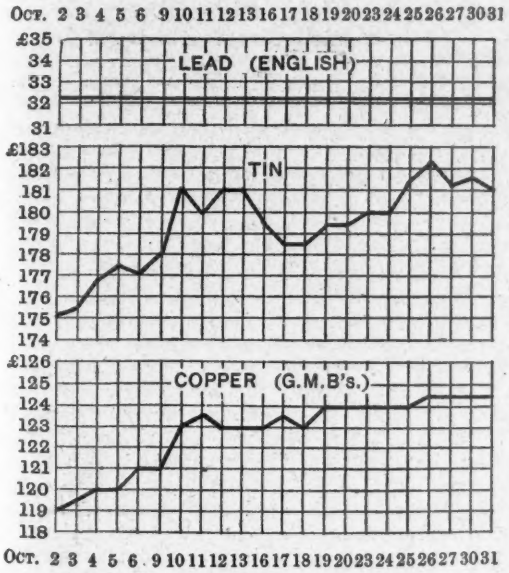
a G. Boor & Co.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
r W. F. Dennis & Co.

**Books and Examinations.**—Whatever some people may say to the contrary, we cannot get on without these things; and many of our readers have probably at some time sat for, or thought about sitting for, one of the various excellent electrical examinations conducted by the City and Guilds of London Institute. Though the examinations are excellent, the same can hardly be said of the lists of works of reference given in the "Programme" of the Institute under the syllabus of each subject. One reason is that some of the books are unobtainable, having been out of print for years; another is that some are obviously very much out of date. Our contemporary, *Electricity*, takes up arms, not for the first time, against this rather absurd state of things, and asks its readers to inform it of one or more books which they have found useful in working up for an examination, stating the grade for which they worked. From the replies, our contemporary proposes to publish representative lists, and these should certainly prove both interesting and useful. Our own readers could help this good work by sending in their opinions to *Electricity*, at 36, Maiden Lane, Strand, London, W.C. We are in cordial sympathy with the scheme, the results of which will be of use to ourselves also, as hardly a week passes without our receiving inquiries as to the best books for specified subjects. The only criticism we have to offer is that where a reader's experience is confined to the perusal of *only one* book on a particular subject, he is not in a position to express an opinion as to the *best* book on that subject.

**Manchester Engineers' Wages.**—The demand of the engineers in the Manchester and South-East Lancashire District for an advance of wages came before the Committee of Production at Westminster, last Friday, when Sir George Askwith and Sir George Gibb met representatives of the masters and delegates from the Amalgamated Society of Engineers. Mr. H. Mansforth (of the Westinghouse Co.) was the principal representative on behalf of the Engineers' Employers' Federation, and the case for the engineers was put by Mr. W. H. Hutchinson and Mr. J. Binns. There were five groups of claims on behalf of the engineers and allied trades, and the increases asked for ranged from 5s. to 9s. a week. The proceedings, which were private, lasted for over two hours. Decisions will be announced in due course.—*Morning Post*.

## METAL MARKET.

### Fluctuations in October.




**German Machinations in China.**—We quote the following comments on the present activity of Germans in China from *Eastern Engineering*:—"In spite of the war German activity has by no means ceased in China. On the contrary, a lively propaganda is being carried on there, not only by German traders themselves, but by officials of the Legation at Peking and the various Consular officers throughout the country. Not content with making every preparation for resuming business after the war, we learn that Germany is actually supplying machinery to China through firms in Sweden and the United States either owned or controlled by Germans. As an instance of the underhand tactics that are employed to gain their ends, we may mention that German agents in China tell the Chinese that Great Britain is blockaded by the German fleet and submarines, and that, therefore, it is impossible for them to obtain machinery or anything else from that quarter. The fact that would-be Chinese buyers have written to British firms respecting the placing of orders, and have received replies to the effect that they are so full up with work that it is impossible for them to take further business, has lent some colour to the German campaign of lying. There can be no question that German traders have got their eyes fixed on China for exploitation after the war, and they are leaving no steps untaken to enable them to realise their object. Thus, it was recently stated that German prisoners are being taught the different dialects of the Chinese, and although at the present time Germany's trade with China is more or less at a standstill, she is retaining men of military age there to maintain her connection, and keep the market open until she is again able to enter into competition. It is also reliably stated that German merchants in China have secured sufficient contracts during the war to give them a good commercial standing immediately the war is over. These, it is true, have mostly been secured by graft and sharp practice. A traveller recently returned from China stated that at the beginning of the war the Germans refrained from quoting on any large contract, but lately most of the largest contracts have fallen into German hands. When the specification for any large contract is now given out they invite the head Chinese concerned to a magnificent dinner—most Chinese deals are settled over food, a point the Germans have been quick to recognise—convince them that the war will be over in a few weeks, make them a handsome present, and secure their permission to insert a clause in their quotation that the material is to be supplied a certain time after the conclusion of the European War. The British firm, not knowing what has transpired, quotes price for the material to be supplied at the present time. The German in this way secures good 'face,' as he has been able to quote lower than his competitors, and has secured the goodwill of the Chinese officials by a little 'qumshaw' or present, which in no way comes out of his pocket, as his price is higher than the after-war price would be. These and similar tactics are being freely employed in China by German traders, who are aided on the political side by the publication of pamphlets in Chinese spreading the most fantastic lies about Great Britain and her Allies. We trust, therefore, that adequate steps are being taken to counteract this pernicious propaganda in China, and that British traders generally will be on the alert to defeat German machinations there, such as those indicated above."

## WAYLEAVES.

By "An Interested Onlooker."

In view of the attention which is being directed to the various aspects of electricity supply in the United Kingdom at the present time, especially from the point of view of linking-up, it seems to be a favourable time to consider the question of wayleaves as affecting the problems connected with the transmission of electricity, both by overhead lines and underground mains.

It is well known that the development of the telephone and, to some extent, the telegraph undertakings has been hindered by the difficulties attendant on the procuring of wayleaves, and further reference will be made to this later.

In this article, we are mainly concerned in considering the subject of wayleaves viewed from the standpoint of the power companies and municipal undertakings, and it is useful to consider how far we can learn from the troubles of the engineers of the G.P.O. and the late National Telephone Co. Most supply engineers have met with the wayleave difficulty, and much has been written on the subject from their point of view during the past few years.

The educative campaign among landowners and others was well begun by the passing of the Telegraph Acts of 1863, 1878, and 1892, and continued under the auspices of the Institution of Electrical Engineers when Mr. Addenbrooke read a paper in 1905.* Later, in 1913,† Mr. Vernier devoted a considerable portion of his Chairman's Address to the Newcastle Local Section to the subject, and freely drew on his extensive experience arising out of his transmission work for the Newcastle Electric Supply Co. Mr. W. B. Woodhouse, chief engineer of the Yorkshire Power Co., has also enjoyed more than one tilt at it.‡ Attention was, however, particularly focussed on it by the I.E.E. paper on "H.T. Transmission Lines," which was contributed by Mr. Welbourn in 1914,§ and which was discussed in London and at most of the local centres. In this paper, Mr. Vernier's remarks on the inconsistent state of the law of wayleaves for overhead lines only were condensed as follows:—

1. The Postmaster-General possesses powers for erecting telegraph and telephone lines, but the procedure to be followed is so cumbersome as to be almost useless. Even these powers are denied to electric supply authorities.

2. Under the Electric Lighting Acts, the consent of the local authority must be obtained by a statutory undertaker previous to the erection of overhead wires, whether these are in the public street or on private land.

3. Non-statutory undertakers can dispense with the consent of the local authority, and both erect wires on private land and cross public roads so long as the wires cause no obstruction above the roadway.

4. Non-statutory undertakers may erect overhead lines without compliance with the Board of Trade Regulations, but the Board has power, if it thinks fit, to order such compliance.

Mr. Welbourn suggested that a strong case had been made out to justify the Council of the Institution in making representations to the Board of Trade for the benefit of the electrical industry with a view to removing the inconsistencies referred to, but no action appears to have been taken. Following up the progressive policy recently adopted, it is hoped that the Council will take the lead in this matter, and also arrange to give one evening during the session of 1916-1917 to a full discussion, and

*Journal*, I.E.E., Vol. 34, p. 511—1905.
†*Journal*, I.E.E., Vol. 52, p.17—No. 223.
‡*Journal*, I.E.E., Vol. 44, p. 802—1910.
§*Journal*, I.E.E., Vol. 52, p. 177—Nos. 226, 227, 228, 230.

then follow it up by appointing a committee to examine the points brought out and prepare a Bill in consultation with the I.M.E.A. and the I.A.E.P.C. The success attending the discussions in London and Manchester on Mr. E. T. Williams's paper this year should be of good augury! The suggested Bill should, *inter alia*, provide for:—

1. A curtailment of the absolute veto on the construction of overhead wires by a local authority.

2. The local authority's refusal of consent should be made subject to an appeal to the Board of Trade. At present, such an appeal is only allowed to power companies in *rural* districts.

In the discussion on Mr. Welbourn's paper, Mr. (now Sir) William Slingo referred to the uphill struggle which the Post Office engineers had faced, and were overcoming by the help of the various Acts of Parliament already mentioned, and he remarked that they would like the procedure to be *more certain and expeditious*.

The interest aroused in the question appears to have led to the passing of the further Telegraph (Construction) Act, 1916. Under this Act, the Postmaster-General has the right to have a "difference" between himself and the owner, lessee, or occupier who refuses or fails to give his consent to the placing of a telegraphic line under, in, upon, over, along, or across his land or building, within two months after being required to do so by notice, settled under the procedure laid down in Sections 3, 4, and 5 of the Telegraph Act, 1878.

This marks an advance, but the procedure referred to is still too clumsy. Something more expeditious is required in these hustling days than a delay of two months, then a hearing of the case by a magistrate, county court judge, or sheriff, whose decision can be appealed against before the Railway Commissioners. Just fancy a man wanting a telephone installed in a hurry in the country and having to await the result of all this legal procedure! And think of the possible cost to the G.P.O.! This, of course, takes no account of *war* telephone work, which may be carried out immediately and without wayleaves under the Defence of the Realm Act.

At this stage it will be well to set out some of the principal wayleave difficulties and hardships which are met with by electricity supply authorities, and then to consider what procedure might be followed in order to ensure a speedy and equitable settlement of differences.

1. *Cost of Wayleaves.*—Some landowners have altogether extortionate ideas as to the value of their agricultural land compared with the value of the electric line to be taken across it and the benefit to the community. One case came under notice a few years ago where it was proposed to cross a field in the open country with six wires, without any poles being planted in it. The owner demanded £1 per wire per annum for the use of the air above his field. Needless to say, no business resulted.

There seems to be a general agreement in England that the *average* capitalised value of the wayleaves for an overhead transmission line is rather more than £100 per mile of route, and it is considered that this is fully three times their real value. One power company has calculated in a number of cases that if it bought a strip of land 70 yards wide over the whole route, it would come to less than the capitalised value of the rents paid for what is only a very partial occupation of the land. Could anything illustrate the grievance more clearly than this?

There is not much experience in regard to wayleaves for cables across fields. In view of the possible and considerable shortening of routes for linking-up and other schemes, this method is likely to receive considerable attention in future. The shortening of a route by some 30 per cent. compared with a road route is often possible, and its adoption would lead to a considerable saving in first cost. Also, the wayleave charge should be very low for a cable, as it would be laid sufficiently deep so that it would not interfere with the tilling of the fields.

Occasionally, a wayleave is required from a neighbouring supply or other authority to enable a "short cut" to be taken. A case in point was brought under the notice of the present writer, recently, where a supply authority desired to save about £6,000 by going for 50 yards through the road of a neighbouring authority. The blood-money demanded for the concession (in war-time, 100) was *half the savings*. Again, no business resulted!

Another supply authority's experience is that County Council charges are usually heavier than those of private owners, the conditions imposed are more stringent, and the negotiations take longer to complete. In one instance, it was desired to lay a connecting main between two portions of a district, and, without more than trebling the expense, this could not be done without running for a short distance under a public footpath alongside a county council school. A private owner would usually have taken an acknowledgment of 1s. to 2s. 6d. per annum, but the Council demanded £1 per annum, plus legal charges. On pointing out that this was a public utility main to feed the system from which the school was lighted, as well as the residences in the immediate neighbourhood, and that the land was owned by the community, and so a smaller sum would be in keeping with the easement granted, a peremptory reply was made to the effect that these were the only terms, and discussion of others was useless. In addition, the burden of keeping the *whole* of the footway in repair was thrown on the supply authority.

2. *Delays in Negotiations.*—Mr. Vernier has pointed out some of the vexatious delays which occur through local authorities having the right of absolute veto on overhead wires. He has also instanced a case of a landowner going to shoot in India and hanging up negotiations for six months.

The delay in Government action under the powers granted by the Electric Lighting Acts for compelling owners to come into line has made this method of procedure of very little general use. It is only when a delay of *months* can be allowed for that any hope of success can be entertained, and the speed with which the Government now rushes through any concessions required when Government war-work is at stake only makes the leisurely procedure of peace-time more exasperating.

In a certain case, permission was refused by an owner to the laying of a cable across partly waste open land, surrounded by disused coal pits, which was not likely to be of much use to anyone. Negotiations were opened with the Board of Trade, and a plan and full particulars were supplied showing the need for using this route. The owner's solicitors raised one point at a time, which meant a letter to the Board of Trade, a copy from them to the owner's solicitors, and the waiting for their reply, which was not unduly hurried.

Correspondence lasted for three months and showed no sign of terminating, and as the cable had become extremely urgent, a longer route had to be found, at an additional cost of £400.

3. *Delays from other Public Utility Authorities.*—Some railway companies are not disposed to give a wayleave across their railways for more than three or six months. This is objectionable, because railway companies are always promoting Bills, which sometimes have to be opposed by the supply authorities, who are thus exposed to the possibility of unfair pressure.

It is an anomaly that public utility services should be denied the use of bridges in some districts without having to pay exorbitant charges. A sum of 5s. per annum would be ample

compensation for the keeping of records of the cables and pipes passing over a bridge, but the usual charge, in some districts, is £1 per bridge if the structure of the bridge is not affected, and with increased rentals up to £5 per bridge if the structure is affected. Owing to the way in which many bridges have been built, it is impossible to effect a crossing without removing and rebuilding a few bricks at either end. Heavy wayleave charges are the result.

In some districts, also, water companies are frequently exempt because they were in existence before many of the bridges were built, but electricity supply authorities, not being in existence at the time, have no protection, and are entirely at the mercy of the bridge owners, although the bridge forms part of a public road, and the cable to be laid is for the public convenience.

4. *Permits from the G.P.O. and other owners of Telegraph and Telephone Lines and Road Authorities.*—Under Section 20 of the Electric Lighting (Clauses) Act, 1899 (62 and 63 Vict., ch. 19) the G.P.O. and other owners of lines may require an undertaker to adopt such precautions as they may specify to prevent any injurious affection of existing lines or lines afterwards erected for telegraph, telephone, or electric signalling purposes.

It is true that the requirements may be disputed, and resort had to arbitration, as provided in the Act, but in the case of new lines this leisurely method of procedure is of little or no use to supply authorities who have consumers waiting to be connected up.

In practice, therefore, the G.P.O. imposes its own terms, which amount to a prohibition of all wires crossing the Department's wires if the pressure on the proposed lines exceeds 3,000 volts. The result is that crossings have to be effected by underground cables in series with overhead power lines, in most instances, as the addition of capacity, by cabling the telegraph or telephone lines, is objectionable at their higher transmission frequencies. The cost of making these special crossings may easily add 20 per cent. to the total cost of a power line.

Frequently, also, crossing a main road by cabling is insisted on by county council and other road authorities, and it may result that, when everyone's claims are met, there is not much advantage in first cost in having an overhead line at all.

This is not the way to encourage the development of electricity supply. Most engineers now recognise that in the next few years we must deal with the transmission of electricity on such a huge scale that the raising of pressures is inevitable, and with the present restrictions this pressure is limited to that for which cables can be successfully and economically built. There is some uncertainty on this point, but probably no British cable makers would undertake in connection with overhead lines to build three-core cables for higher working pressures than 40,000 volts and single-core cables for higher than 60,000 volts A.C. on the star system.

It seems to the writer that it should not surpass the ingenuity of British engineers to devise some method of providing *absolute* protection for the Department's wires against injury from power wires worked at any voltage. The writer sees no particular difficulty in doing all that is needed by a combination of electrical protection for future power circuits in the form of, say, the Merz-Hunter split conductor system, and of mechanical protection in the form of a substantial earthed metal guard which might completely or partially surround the power circuits for the requisite distance, and which would be earthed to the satisfaction of the G.P.O. If the I.E.E., I.M.E.A., and I.A.E.P.C. are in earnest on this matter, there should be no difficulty about getting a round-table talk with the G.P.O. engineers, and the assistance of Mr. Trotter should certainly be requested.

The road authorities may have to be met in another way. The writer thinks that supply authorities should have the right given to them, where no other wires exist, to cross all roads in rural districts with wires unless the road authorities appeal to the Board of Trade and successfully demonstrate that there are real objections in particular cases. Such a real objection might be a definite intention to build on the adjacent land within, say, five years.

*Suggested Procedure.*—It is well-nigh impossible to suggest any procedure which will satisfy everybody and, at the same time, ensure that wayleaves may be obtained speedily for overhead lines or underground cables. It is an indispensable condition that full justice shall be done to both parties to a wayleave dispute, and some machinery must be devised to secure this and, at the same time, to ensure that all avoidable delays in effecting a settlement shall be short-circuited.

Most Britishers prefer to compromise rather than to fight, unless some vital principle is at stake, and with this in mind, it is suggested that supply authorities shall have the *prima facie* right to go with their mains practically everywhere within their area subject, where necessary, to the owner's consent, in order to carry on their business to its fullest extent. This would be subject to the reservation that where an owner objected, and failed to come to terms with the supply authority within, say, one month of receipt of notice of intention to proceed with the work, the supply authority would have the right to lay the whole matter before the Board of Trade, who should be placed under a legal obligation to inquire fully into the case of both parties to the dispute within, say, one month, and give a decision within, say, a further two weeks.

The Board of Trade should have conferred on it the right to give a final decision as to the route to be followed, and to determine the amount to be paid to the owner or tenant for rent and by way of compensation for damage done during construction, &c. In order to be quite fair to our gas competitors, the writer would not oppose similar facilities being granted to them.

The plan outlined above could easily be elaborated with the goodwill of all the interested parties and the assistance of the Board of Trade into a workable one. It is essential to the electricity supply authorities that simplicity of procedure, combined with speed and a definite time limit, should be secured.

The present writer would like to see a further trial given to the so-called "voluntary" principle for a period of, say, three years, and working on the amended lines suggested above. If this failed in practice, we should automatically pass to "compulsory" methods, to which the nation is so rapidly becoming accustomed.

The Electrical Review has, from time to time, called for compulsory wayleaves without defining exactly how this could be brought about, and it is hoped that these notes may be of some assistance in focussing public opinion on what is desirable and practicable. The urgency of the question can be measured from the fact that there are already about 1,500 miles of high-pressure overhead lines in the United Kingdom, apart from the numerous low and medium-pressure lines. Many supply authorities are expecting a big increase after the war as the result of the boom which electrical driving, &c., has enjoyed during the past two years. The electrification of railways, and the application of electricity to chemical and metallurgical processes will also bring much additional load. The transmission system for dealing with these loads and for enabling linking-up schemes to be carried out must not be unduly delayed by antiquated wayleave methods.

## ELECTRIC COOKING AND HEATING.

By A. F. BERRY.

(*Extracts from paper read before the* Association of Supervising Electricians.)

A large number of individuals have sent in to me from time to time figures showing the savings effected by the introduction of "Tricity" cookers in their establishments. The majority of the figures relate to private houses, but some relate to canteen and school equipments. It is clear that the butchers' bills in private houses that used to be over £50 per annum are reduced to £40 per annum; that a plate of meat in a munition workers' canteen is reduced in the ratio of 5d. to 4d., that the weight of meat used in a term in a school of 100 is reduced in the ratio of 2,400 lb. to 1,950 lb., when the older methods of cooking are discarded and "Tricity" cookers are fully employed. It will be seen that the retention of the old methods of cooking means that approximately 25 per cent. more meat is being purchased than need be. There is an economy also in making jam, marmalade, &c. I found, for instance, that the additional weight of marmalade when made on an electric hotplate instead of on the coal fire was of sufficient value to pay for the total cost of cooking any way many times over.

My experience of the cost of many thousands of Tricity-cooked meals leads me to tell you that you must expect that a good square meal will cost one quarter of a unit per person—that is, for a number of people. In the case of schools, where one may take it that the meals served are the equivalent of two heavy ones daily, it has been found that rather less than one-half of a unit per day per person is required. In private houses, where the numbers are less and, perhaps, the meals more numerous, something like one unit per day per person will be required.

In making jam, I find that the cost works out at about one unit for each 8 lb. of jam; marmalade will cost more than this. If there are two boilings it will mean that 4 lb. can be produced for each unit of electricity consumed.

I do not think that those who do not use electricity in their homes for cooking, even though they are electrical engineers, can ever hope to convince others of the full advantage of electric cooking. They are certainly not in a position to express a personal opinion in regard to all the advantages of electric cooking if they have not made use of it themselves. The glib way in which nine persons out of ten will tell you that electricity "must be expensive" for cooking is a testimony to the slack way in which suppliers of electricity have talked about there being no heat with electric *light*, and it is also an equal testimony to the efficacy of the publicity of "the opposition."

The reliability of electricity for cooking purposes should be one of the first considerations. I think, however, the remembrance of early troubles accounts in a great measure for the apathy of some electrical engineers towards electric cooking. My experience has been that ordinary users of electric cookers are even more enthusiastic regarding them than many supply engineers and contractors.

The improvements in detail apparatus, such as fuses, indicators, contacts, terminals and switches have all helped to make electric cooking the solid proposition it now is. To the householder it did not matter what stopped the cooking—a faulty accessory or a faulty "boiling ring." The meals must be ready at the right time—excuses do not "feed the brute."

The use of indicators to show when hot plates, &c., are "on" is a great help in the direction of economy. The latest in combined fuses and indicators combines in a most cheap and practical form the fuse and indicating device we have found it necessary to provide. This is only one detail of many that have been brought up to a high state of perfection. If you will consider that in this small apparatus you combine a pilot lamp and fuse you will appreciate how much more robust, more easily replaceable and economical, both in consumption and space, electrical accessories have become.

I would like to impress upon you that electric cooking is here to stay, and that the sooner the whole electrical fraternity make the utmost use of it, the better will it be for themselves and for the community. Pray do not let anyone retain the impression that electric cooking is for the rich. I have personally been more than interested to find that the Tricity cooker is the friend of the artisan's wife. It goes to the palace and cottage too.

Turning to electric heating, the electric lamp radiator is with us still and is undoubtedly popular. It is an unfortunate fact that many of those who use a four-lamp radiator expect to get from it much more heat than they are entitled to. I venture to predict that when the lamps are so made that their filaments are run at such a temperature that the shorter wave-lengths of their radiant emissions pass through their clear glass surrounds readily and the filaments are screened from direct vision by suitable reflectors, then we shall find that our dwellings are warmed and lighted in a manner approaching most nearly that in which we receive light and warmth from the sun. This method of lighting and heating will be as near perfection as possible if we can also arrange, as I hope shortly to show that we can, to destroy the monotony of the lamp radiator as well as increase its efficiency.

The importance of good radiating effect from an electric fire and its capacity to hold your attention is considerable. You may have noticed that the only time a lamp radiator interests you sufficiently to hold your attention is at the moment of being switched on. A good log fire or a clearly burning coal fire interests you all the time. They are conducive to steady thinking, and the contemplative frame of mind that brings calm and the solution of one's little problems. For many years I and those who are working with me have endeavoured to introduce into electric fires more comfort and some features of interest that will hold one's attention sufficiently to make "sitting in front of the fire" a most agreeable occupation.

To-night I am able to show you for the first time what is generally considered by those who have seen it privately an effect of great value. As you are aware, a great deal of the life of a fire is indirectly due to the differing refrangibilities of the various vapours and heated air through which you see the burning fuel, and also to the varying degrees of redness caused by the play of air upon the fuel. I have endeavoured to combine these effects naturally in the "Tricity" Flame Fire which you see before you. The result gives a breadth of effect, and simulates in a perfectly natural manner the appearance of a coal fire at its hottest.

There are certain points in connection with the development of this side of our industry which should always be borne in mind when discussing the subject of electric heating. In the first place, electric heaters of small capacity should not be put forward to work miracles. A small fire is quite good and economical for heating ordinary black flat-irons, boiling water (not too rapidly), and warming small rooms or taking the chill off larger ones, &c. It is, however, a great mistake that has been made by many to install heaters that are too small. The next thing is that an electric fire must have a big radiant surface if it is to give a sense of comfort. It must also be sufficiently hot and powerful and attractive to draw one towards it, and then drive one back from it.

Another feature that should be borne in mind is that ordinary convector types of heater, and I am afraid some other types, have been designed in such a way that they would be most useful to us if we were flies and could sit with our feet on the ceiling. Warmth is wanted low down in the room, not high up. Just as one could appreciate electric slippers, one cannot imagine anyone wearing an electrically heated hat. Keep your head cool, but don't get cold feet. A judicious combination of radiant and convected heat is most welcome, and with electrical fires can be arranged for.

The fourth point is that electric fires should be designed to look like electric fires. The earlier samples were either made to resemble obsolete fires or else appeared to bear no resemblance to anything at all. Electrically, we are free from troubles due to fumes and, therefore, our originality can have full play in design. There is no need to make an electric fire look like a fireplace. It must be remembered, however, that the fireplace is the natural place in which to stand a powerful electric fire. It is useless to talk about the heat going up the chimney; steps must be taken to prevent it. We have sat round the fireplace for too many generation to get out of the habit. The design and arrangement of a room, too, the placing in a room of our household gods in the way of pictures, vases, &c., to say nothing of the timepiece on the mantelshelf, have been regulated by the fact that we shall be sitting round the fireplace. We must, therefore, bow to the inevitable, and for certain rooms make up our minds that electric fires will be wanted in their tens of thousands for putting into fireplaces. I do not think we shall need to follow the gas companies in their endeavour to pull out the coal grate, as we have no difficulty with regard to fumes.

It must not be expected that the economy alone of electric heating for rooms will force it upon householders in the way that electric cooking will do. The actual coal consumption of a private house for the various living rooms is small compared with that used in the kitchen. The economy in the consumption of coal, therefore, is very little worth. It is on the score of general convenience, cleanliness, and comfort that electric fires are making their way into the homes of the people. It is difficult to say how far the consumption of electricity can be reduced and the comfort of the individual maintained. I have come to the conclusion that for personal comfort the heating effect of one-fortieth part of a unit applied directly to the hands and feet of a warmly clothed individual would suffice to keep one warm when at work during very cold weather. It would appear that we may in time hope for something less than 100 times this amount, namely, 2½ units, to be made sufficient to warm a room efficiently.

**New Zealand Trade.**—Mr. R. W. Dalton, H.M. Trade Commissioner in New Zealand, states that when certain German companies were proclaimed enemy concerns, their liberal advertisements in New Zealand papers naturally ceased. Articles similar to, or better than, those which they formerly advertised are made by British firms, but such firms have not adopted any advertising campaign to make their goods known. One result of this may be that after the war present enemy concerns will have an opportunity for booming their goods again, and their real origin will be forgotten.

## ELECTRIC VANS FOR LAUNDRY WORK.

With the steady progress in popularity of the electric vehicle in this country, it is surprising that laundries appear to be entirely unmentioned in the lengthy list of electric vehicle users which forms such an interesting feature of our quarterly contemporary, *The Electric Vehicle*. This is obviously a direction offering considerable possibilities, and it may be of some interest to refer briefly to American experience in this matter. As a result of an interview, Mr. Jackson Marshall, the energetic secretary of the Electric Vehicle Section of the N.E.L.A., records the opinion of the manager of the Brunswick Laundry, New Jersey, that as soon as the all-round efficiency of the vehicle is realised by the laundry industry, most laundries will use the "electric," well-nigh to the exclusion of all other means of collection and delivery.

The daily load average of the Brunswick Laundry is approximately 1,500 lb., and at least 65 horses are necessary to do this work, allowing for emergencies. Under the same conditions 33 electric vehicles are sufficient, and during inclement weather the only extra preparation necessary is the addition of chains, and each driver can equip his car with non-skid chains in 15 minutes. The simplicity of the "electric" enabled the men who had been driving the horse to learn to operate the new vehicles very successfully in a few hours.

The comparative operating cost and upkeep of the electric vehicle and the horse are as interesting as the facts concerning the dependability of each.

The investment for a horse-drawn equipment, including stable room, was $1,515; for an electric delivery car complete $2,500. The extra investment necessary for the "electric" was, therefore, approximately $1,000.

The monthly cost of 65 horses and wagons totalled $1,713; while the monthly cost of one electric delivery car, including interest at 6 per cent., amounted to $29, representing a total for 33 cars of $957.

The depreciation of the car is balanced by the depreciation of the horses, wagons, harness, &c. Thus the "electric" shows a saving of over 40 per cent.

The "electrics" of the Brunswick Laundry average 25 miles per day, visiting all the outlying suburban districts. Some of the best drivers deliver as many as 900 bundles per week, and make an average of 32 miles per day. At an average of 25 miles per day, and a current cost of $4 per month, the current cost per mile is about six-tenths of a cent on this basis; figuring 900 bundles delivered per week, the energy cost of each bundle delivered is about 1/100 of a cent.

Repair bills are a negligible quantity in electric vehicle operation. Every week an "electric" is taken down, carefully looked over, cleaned, and put in first-class order; thus every 33 weeks each car goes through a thorough overhauling.

The average life of the tires on the gasoline cars for long hauls is about three to four months, while those on the electric vehicles last from a year and a half to two years.

The advertising value of the electric must be considered, also the safety element should be mentioned. Collisions are very rare things with these cars, even in congested traffic, as they are started and stopped so easily.

The bodies of the delivery cars which the Brunswick Laundry use are 4½ ft. × 5 ft. × 7 ft. behind the driver's seat. The garage of the Brunswick Laundry is 50 ft. × 140 ft., and this is now being duplicated, which will provide space for about 45 electric vehicles

The Keystone Laundry Co., one of the largest in Pittsburg, recently decided to use the electric truck, and as a result ordered five vehicles. One of these "electrics" on a test-run over the famous hills of Pittsburg showed 63 miles on a single charge of the battery. At all times during the run the car carried a load of 642 lb., in addition to the driver and an official observer. The cost of the electric current for this mileage was but 49 cents, or four-fifths of a cent per mile.

The Sanitary Laundry, of Hartford, on September 6th, 1913, installed one electric vehicle, and between that date and October 23rd of the same year the car had covered 1,545 miles. Before purchasing this "electric" the Sanitary Laundry was operating four horse-drawn wagons and 400 miles per week, or 100 miles for each wagon per week. Two teams were disposed of when the "electric" went into service, and the two remaining horses at that time were covering 70 miles per week, instead of 100 miles which they formerly covered, the difference representing additional work satisfactorily discharged by the electric vehicle.

The Charity Organisation Society, of New York City, reports that the three electric vehicles in the service of its laundry have reduced the cost of delivery at least 20 per cent., and the general results are much better.

The Salem Laundry installed one electric delivery car, and within six months an order was placed for six more cars of the same type. In four months after its first installation, the J. Arthur Anderson Laundry, of St. Louis, put four additional cars in service. Both the Pilgrim and Crystal Laundries, of Brooklyn, are operating three electric vehicles, repeat orders having been given for two cars each, after the first car had been well tested.

## THE NATIONAL INSURANCE ACT, 1911.

The following additional decisions have been published :—

Contributions are Payable for

1,981 X. Armature and coil winders employed in the repair of electrical machinery.

1,982 X. Workmen engaged wholly or mainly in :—

(1) The manufacture (including generating and compressing) of acetylene gas.

(2) The manufacture of cylinders for holding the gas.

(3) Examining cylinders and filling them with porous material.

1,997 X. Workmen engaged wholly or mainly in the manufacture or repair of arc lamps.

Contributions are not Payble for

1,985. Workmen (other than sawmillers, machine woodworkers, metal or leather workers) engaged in making small switch boxes or fancy boxes, whether covered with leather, cloth, velvet or similar material, or polished, and not intended for use in war (application 403 X).

1,986. Workmen engaged wholly or mainly in the preparation of non-conducting compositions for covering boilers, pipes and other parts of heating or refrigerating apparatus. (Application 403 X.)

1,988. Workmen (other than sawmillers and machine woodworkers) engaged wholly or mainly in repairing crates, casks barrels, which are not intended for use in war.

1,993. Casual labourers employed on or about docks or wharves and engaged in loading and discharging cargoes and not employed continuously by the same employer on premises which are used mainly for the purpose of any insured trade.

2,000. Workmen (other than metal workers) engaged in making silk shades for electric light and gas fittings.

2,019. Workmen engaged wholly or mainly in washing slack for coke ovens.

## ELECTROCHEMISTRY IN NORWAY.

A review of the situation of the electrochemical industry in Norway during the past two years has just been published in the French *Journal du Four Electrique*, which has now reappeared after a temporary suspension caused by the war. The review is written by our contemporary's correspondent at Christiania, who states that the electrochemical works were surprised by the war in full execution of orders for nations of the belligerent Powers, as the whole of the Norwegian production is exported. Certain of these contracts were broken by the force of circumstances, particularly owing to the impossibility of procuring ores and other raw materials which are indispensable to the industry, for almost all raw materials are purchased from abroad. The works had consequently to exist on their stocks, the impending exhaustion of which rendered the companies really apprehensive. But the war was then taking a new turn, and about the beginning of 1915 it became clear that, as hostilities were likely to last a long time, an important part would be played by those raw materials which served for the manufacture of munitions. The Norwegian works which produce nitrates, carbide and cyanamide, ferro-alloys and aluminium, then found themselves approached from various quarters, and the output was vigorously resumed. The difficulties of obtaining raw materials continued to be considerable, and prices and wages still moved upwards; but as sale prices also advanced, the final result has been that most of the electrochemical works realised large profits last year and are also doing so in the current year.

The dominant fact in Norway, from the economic and financial standpoint, during the past two years, is the constitution in the banks and private safes of monetary reserves having no precedent. Indeed, the war has enriched Norway, or at least every one concerned with armaments, shipping, and international trade in general. The current accounts at the banks have grown to such excessive dimensions that certain institutions have refused to accept further deposits. It is under these circumstances that the shipowners have turned their attention towards the industries, and this represents the great change which has taken place in Norway since the outbreak of the war. As is known, it was formerly almost impossible to raise a shilling in Norway for industrial undertakings, which had to be established with foreign capital, although it has to be explained that if no native money was forthcoming it was due to the absence or scarcity of capital for investment. Now, however, "a gale of industrial nationalism" is blowing over the country, and many undertakings have been established solely with Norwegian capital—as, for instance, shipping lines, and concerns for the utilisation of waterfalls and the production of wood pulp, chemicals, &c.

The correspondent proceeds to refer to certain works of the Nitrogen Products & Carbide Co., although a portion of his statements has been apparently eliminated by the French military censor. This company, which owns these works and the majority of the shares in the North-Western Cyanamide Co., has established a great industrial undertaking at the bottom of the Oddafjord, where over 70,000 h.p. are utilised in the production of ammonium nitrate, nitric acid, and perchlorates. The power is supplied by the Tyssefaldene A.S., and new works are also in course of construction at Aura. Among new installations mention is made of the extension of the aluminium works of the Norske Nitrid at Eydehavn, whilst the company is building a second aluminium works at Tyssedal, in the Oddafjord. In the case of ferro-alloys, a

considerable increase in the production has been made by the Hafslund Electrochemical Works, as well as at the Porsgrunds Works; and the Hafslund Co., which owns the Hafslund waterfalls and supplies the electrochemical works with power, has now passed entirely under the control of Norwegians, who have purchased the shares (three-fourths of the capital) which were held by the German Schuckert Co. The nickel refinery at Christiansand has expanded its production, and a new works for ferrochrome has been erected at Tyssedal. But the industries which have to depend upon the importation of foreign ores are far from participating in the general prosperity, owing to the comparative scarcity of raw materials and the high freight rates which prevail.

The activity of the group of the Elektrokemisk Industri has been applied to its branches—the Arendal Sveltverk, which produces carborundum and ferro-silicon, and the Bjolvefossen Works, which is erecting a large carbide and cyanamide works in the fjord of Hardang. A further national undertaking is the Hoyang Faldene or Narck Aluminium Co., which has been formed exclusively with Norwegian capital amounting to £686,000, and which has commenced to utilise the falls in the Sognefjord and the construction of an aluminium works, the raw materials for which will be obtained from France. In conclusion, the correspondent refers to the formation of the Florli A.S., which proposes to lay down plant for the electrical production or refining of steel.

## NEW PATENTS APPLIED FOR, 1916.

**(NOT YET PUBLISHED).**

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford.

15,023. "Carriers for fusible cutouts." W. Lawrence & Mavor and Coulson. October 23rd.

15,027. "Mechanical appliance for switching off gas and/or switching off current of electricity at any desired time." D. Broucher. October 23rd.

15,033. "Contacts for electric switches, &c., and mounting or supporting same." A. Crawford, W. Preston, and W. Sanders & Co. October 23rd.

15,036. "Electrical distributing and/or intensifying system." W. A. Clark, H. G. Longford, W. W. Longford, T. Morris & The Sphinx Manufacturing Co. October 23rd.

15,041. "Electrical illuminating device in conjunction with walking-stick, umbrella, &c." E. J. Whiddon. October 23rd.

15,053. "Electric candle fittings." H. Garde. October 23rd.

15,054. "Control switches for electric measuring apparatus." O. Anderson. October 23rd. (Sweden, November 11th, 1915.)

15,072. "Vacuum tubes of the Audion type. J. Biguet. October 23rd. (France, October 23rd, 1915.)

15,076. "Overload electric switches or cut-outs." P. G. van Wijk. October 23rd. (Holland, June 15th.)

15,077. "Loading coils for superimposed telephone working, &c." C. E. Hay & H. W. Sullivan. October 23rd.

15,078. "Sparking plugs." A. R. Hemming & C. T. Westlake. October 23rd.

15,095. "Electric flashlamps." C. R. Hall. October 24th.

15,121. "Searchlight." J. Thomson. October 24th.

15,123. "Automatic electric plug and switching contrivance." D. M. Edwards. October 24th.

15,137. "Electrolytic cells." F. G. Wheeler. October 24th. (U.S.A., October 30th, 1915.)

15,153. "Electric radiant-heat fire." H. S. Ellis & J. C. Petersen. October 25th.

15,177. "Portable electric signalling lamps." W. T. Coulson. October 25th.

15,187. "Electric transformers." The British Electric Transformer Co. and T. R. Renfree. October 25th.

15,236. "Electrodes for electrical furnaces." W. B. Hamilton & J. Holland. October 26th.

15,242. "Electric heating and melting furnaces." V. Stobie. October 26th.

15,252. "Process of uniting metals or alloys by electric welding." H. L. T. Wolfe. October 26th.

15,259. "Electric measuring instruments." C. Coleman, E. I. Everett and P. Hamilton. October 26th.

15,269. "Batteries for electric pocket lamps." Hollandsche Elementenfabriek Juliana. October 26th. (Holland, October 5th.)

15,274. "Generation of sustained electric oscillations for wireless telegraphy and telephony." J. Bethenod. October 26th. (France, November 5th. 1915.)

15,290. "Electric current rectifiers." H. Wade (Mills). October 26th.

15,310. "Operation and carriage of electric flashlamps." E. Nuttall. October 27th.

15,337. "Electric joint-making washers." C. J. Beaver & E. A. Claremont. October 27th.

15,339. "System for multiplex wireless telegraphy." B. J. Corder. October 27th.

15,350. "Spark plugs." M. C. E. Bundy (C. L. Bundy). October 27th. (U.S.A., November 2nd, 1915.)

15,351. "Ignition systems." C. T. Mason. October 27th. (U.S.A., June 30th, 1915.)

15,358. "Wireless signalling systems." British Thomson-Houston Co. (General Electric Co., U.S.A.). October 27th.

15,359. "Electric heating element for kindling." R. K. Hearn. October 27th.

15,365. "Trolley heads for electric tramcars." C. Syombo. October 27th.

15,366. "Electric accumulators." W. H. Exley & H. Leitner. October 27th.

15,398. "Ignition devices for internal-combustion engines." R. G. L. Markham. October 28th.

15,401. "Adjustable marks or scales for aeronoids, air speed-indicators, magnetic compasses, &c." Aeronautical Instrument Co. October 28th.

15,419. "Ferrule or sleeve for braided wire coverings on electric cables, &c." Powell & Hammer, W. A. Shepherd & F. E. Wilson. October 28th.

## PUBLISHED SPECIFICATIONS.

### 1915.

14,145. Electric Indicating and Lighting Systems. A. Blackmore. October 6th.

14,209. Automatic Glass-blowing Machines. British Thomson-Houston Co. (General Electric Co., U.S.A.). October 7th.

14,310. Process for the Production of Cuprous Oxide Electrolytically. B. Hunt. October 9th.

14,365. Fluid-pressure Valves. British Thomson-Houston Co. (General Electric Co., U.S.A.). October 11th.

14,377. Dynamo-electric Machines. A. H. Neuland. October 11th.

14,405. Electrically-heated Cooking Utensils. L. Heller. October 12th. (Convention date, July 16th, 1914.)

14,468. Electric Arc Soldering. E. H. Jones. October 13th.

14,533. Mounting of Electrical Apparatus in Frames or Cases. H. B. Prentice. October 14th.

15,824. Construction of Grids for Secondary Batteries. G. A. Smith. November 9th.

16,395. Electrical Switches. A. C. Wynne. November 20th.

16,466. Electric Contact Thermometers. R. P. Costello. November 22nd.

17,366. Electric Heating and Cooking Devices. J. Sayers. December 11th.

17,844. Starting and Lighting Sets for Automobiles. British Thomson-Houston Co. (General Electric Co., U.S.A.) December 21st.

18,137. Dynamo-electric Machines. S. H. Martin. December 29th. (Convention date, January 2nd, 1915, U.S.A.)

### 1916.

The numbers in brackets are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1,103. Radio-active Sighting Devices for use with Firearms. B. Solaro del Borgo. January 30th, 1915. [100,050.]

2,068. Electro-magnetic Driving Gear for Clocks. J. Lameris. February 11th, 1916. [101,652.]

2,556. Electrode Holders for use in Electric Soldering and Welding with Fusible Electrodes. Quasi-Arc Co. & A. P. Strohmenger. February 21st, 1916. [101,655.]

2,704. Manufacture of Electric Incandescent Lamps with Metallic Incandescent Body. Deutsche Gasgluhlicht Akt. Ges. (Auerges). May 4th, 1915 [100,387.]

3,745. Alternators for the Production of High-frequency Electric Oscillations. Soc. Francaise Radio Electrique. March 13th, 1915. [100,184.]

5,628. Electrolytic Method for Removing Oxide or Rust from the Surface of Iron or Steel. P. Marino. October 7th, 1915. (Divided application on 14,230/15.) [101,667.]

7,517. Sparking Plugs. A. E. Lamkin. May 26th, 1916. [101,678.]

**Amending the Corruption Act.**—The following clauses are included in the new Bill which has been introduced by the Home Secretary for the prevention of bribery in connection with Government contracts:—

1. Any person convicted on indictment of a misdemeanour under the Prevention of Corruption Act, 1906, or the Public Bodies Corrupt Practices Act, 1889, shall, where the matter or transaction in relation to which the offence was committed was a contract or a proposal for a contract with His Majesty or any Government Department or any public body, or a sub-contract to execute any work comprised in such a contract, be liable to penal servitude for a term not exceeding seven or less than three years. Provided that nothing in this section shall prevent the infliction in addition to penal servitude of such punishment as under the last-mentioned Act may be inflicted in addition to imprisonment.

2. Where in any proceedings against a person for an offence under the Prevention of Corruption Act, 1906, or the Public Bodies Corrupt Practices Act, 1889, it is proved that any money or other consideration has been paid to or received by a person in the employment of His Majesty or any Government Department or a public body by or from a contractor, or agent of a contractor, holding a contract from His Majesty or any Government Department or public body, the money or consideration shall be deemed to have been paid or given and received corruptly as such inducement or reward as is mentioned in such Act unless the contrary is proved.

**Electric Transport on the Rand.**—The extent to which electric locomotives have been adopted for underground ore haulage—59 of one make alone being in use—shows that their advantages are already quite widely appreciated. Main haulage ways, designed for large tonnage, are in most instances best served by the overhead trolley type of locomotive. This generally involves the installation of a conversion plant for transforming alternating three-phase power direct current of suitable voltage (250 or 500 volts). For other levels, and especially those handling smaller tonnage, and from which several cross-cuts run off to the face, self-propelled locomotives, equipped with storage batteries, offer great advantages. Machines of this type are running successfully or are about to be put in use on several Witwatersrand mines—notably, Crown Mines, East Rand Proprietary, Kleinfontein and Government Areas. Such locomotives require for their charging comparatively small and inexpensive conversion plants. Electric lorries have also proved their worth for surface deliveries of mine stores—such as dynamite, coal and heavy stores. Large electric trucks, equipped with Edison batteries, are in use on the East Rand, Knights Deep, Simmer Deep and Crown Mines, and are effecting great savings of time and money. It appears, therefore, that economies of money and native labour can be effected by the further introduction of electricity in transportation.—*South African Mining Journal.*